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Index to Volume XXXIX.

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Accidents from Electric-cars in Boston, 18
Acoustic Properties of Public Buildings. A Distinction in the, 9
Administration Building at the World's Fair. The, 107
"*Advanced Building Construction*," 158
Advertisements. Circulars, Catalogues and, 49
" Natural Scenery and, 16
Agency of the Architect dependent on the Terms of the Contract with his Client. The, 145
Agrippa and the Pantheon. The Portico of, 33
A. I. A. Board of Directors and the Designing of Government Buildings. The, 44, 88
" Future of the, 190
" Minnesota Chapter's Draughtsmen's Competitions, 130
" Officers for 1893. The, 125
" Secretaryship of the, 65
" Southern Chapter, 61
" Worcester Chapter, 46, 95, 125
Alterations on a Condemned Building, 81
Aluminium. Cheap, 64
America. A Frenchman on the World's Fair and, 58
American Architecture. An English Humorist on, 94
" Fine-Arts Society. Mr. G. W. Vanderbilt's Gift to the, 17
" Institute of Mining Engineers. The Convention of the, 170
" *vs.* Foreign Marbles, 114
Analysis of a Roof-truss. Graphic, 15, 16
Ancona. The March of, 123
Antiquities. The Manufacture of Spurious, 82
Ants. White, 116
Arbitration. A Question of, 1

ARCHÆOLOGICAL: —
Copper Age. The, 176
Pantheon. Late Discoveries Relating to the, 33
Quernes, or Hand-mills, 175
Saxon Church at Bradford-on-Avon. The, 100
Statue of Rameses II. A Colossal, 48
Temple of Baal. Ruins of the, 32
Yucatan for the World's Fair. Reproductions of the Ruins of, 160
"*L'Archéologie Chrétienne*," 140
Architect and his Materials. The, 133
" Owner and Builder before the Law, 3, 19, 85
Architect's Home. An, 74

ARCHITECTS: —
Duties and Responsibilities of. The, 91
Office-help for, 37, 117, 149
Sketches of Italian, 138
Unprofessional Practices among, 28

ARCHITECTURAL: —
Compromise. An, 40

ARCHITECTURAL: —
Exhibit at the World's Fair. Accepted Contributions to the, 186
League. The, 45, 79, 94, 158
" Exhibition. The, 45, 79
Shades and Shadows, 54

ARCHITECTURE: —
Belgian, 147, 163, 179
English Humorist on American. An, 94
Ile-de-France School of Architecture. The, 35, 51, 67, 83
Languedocian School of. The, 99, 115, 131
Arctic Home. Lieutenant Peary's, 143
Arms and Armor. Chinese, 136
Art and Education. A Century of French, 61
Arthur by the New York Park Commissioners. The Refusal of the Statue of President, 113
Artillery in the Past. Heavy, 182
Art. The Tate Gallery of British, 167
Art-worker's Guild. The, 29
Assassination of a French Referee. Attempted, 128
Association of Architects. The Convention of the Ontario, 169
Athletic-Club Building. The Fire in the Chicago, 27
Atlanta, Ga. The State-house at, 13
Atmosphere in School-rooms. Testing the, 2
Auditorium Annex, Chicago. The, 135
Australia. Letter from, 169

Baal. Ruins of the Temple of, 32
Ball. The Gate-post, 159
Bar. A Costly Australian Hotel, 169
Bathing Establishment. A Pacific Coast, 144
Belgian Architecture, 147, 163, 179
Belgium. The Truth as to Labor in, 96
Bell at Moscow. The Big, 176
Berlin. Test of Fireproof Materials at, 176
Bibliography of Building-stone. A, 142
" " Lime, Cement, Mortar and Concrete. A, 142
Bicycle Tour. The Stevens, 174
Billiard Ball. The Cost of a, 64
"Bishop." The Work of an Architectural, 65
Board of Education's Building Bureau. The Chicago, 72, 135
Boilers. Safety-valves on Range, 32
Book-collector. A Notable, 96
Boston Society of Architects and the Copley Square Competition. The, 129, 177

BOSTON: —
Architectural Club. The, 14
Brooks. The Proposed Memorial to Phillips, 97
Copley Square. The Proposed Rearrangement of, 129, 177
Electric-cars in. Victims of the, 18
Fire. The Lincoln Street, 161
Fires and the Insurance Companies. The recent, 48
Garbage-crematory Test. A, 144

BOSTON: —
Létang in the new Public Library. Proposed Memorial to Professor, 81
Shopping in the Great Stores. The Danger from Fire attending, 177
Society of Architects. The, 14
State-house. The Proposed Rebuilding of the, 17
Tenement-building. Coöperative, 80
Trinity Church. The Completion of, 97
Bourse. The Origin of the, 164
Bradford-on-Avon. The Saxon Church at, 100
Brick a Dangerous Cargo, 135
" in Cold Weather. Laying, 176
" veneered Buildings, 175
Brickwork. The Saltpetering of, 30
Bridge. A Famous Wooden, 80
" Foundation. Wool for a, 32
" London. The Tower, 139
British Art. The Tate Gallery of, 167
Bronze, 75
Brooklyn and New York. Electric Mail-tube between, 1
" Building-laws. Revising the, 161
Brooks. The Proposed Memorial to the late Bishop, 97
Bruges. The Architecture of, 163
Builder before the Law. Architect, Owner and, 3, 19, 85
Builders not bound by Trade-union Rules, 32

BUILDING: —
Bureau. The Chicago Board of Education's, 72, 135
in Chicago, 71
Laws. Comparative Municipal, 8, 26, 90, 122, 168, 187
" Revising the Brooklyn, 161
Ordinance. Chicago's new, 185
Permit. Chicago's New Form of, 185
Stone. A Bibliography of, 142
" A Report on, 170
Stones. The Selection of Suitable, 133
Burial-grounds. Legal Rights in Private, 31
" in London Churches, 31
Burned Clay as a Roofing Material, 75
Burning of Mr. Cornelius Vanderbilt's House at Newport, R. I., 47
Burglary as an Adjunct of Building Operations, 130

Caisson Foundations of the Manhattan Life Insurance Co.'s New Building. The, 66, 111
Calcutta. St. Paul's Cathedral, 62
Calumet-Club Fire. The Chicago, 71
Cambrai. The Cathedral of, 62
Canada. Letters from, 57, 106, 169
Canadian Architect and Builder, 107
Canadian Exhibits at the World's Fair, 58, 106
Capitols. Some Southern, 13
Carbonic Acid applied to Refrigeration, 180
Cardiff Giants. Manufacturing, 82
Casa Santa at Loreto. The, 123
Cash. Chinese, 152

Catalogues and Advertisements. Circulars, 49
Cathedral in Mexico. Proposed great, 70
" of Cambrai. The, 62
Cedar at the World's Fair. The Japanese Dwarf, 159
Cellar or no Cellar? 127
Cement. A Bibliography of, 144
" Retempering, 33
Century of French Art and Education. A, 61

CHICAGO: —
Athletic-Club Fire. The, 27
Auditorium Annex. The, 135
Board of Education's Building Bureau. The, 72, 135
Building Ordinance. The New, 185
" Permit. The New Form of, 185
Buildings. New, 71
Calumet-Club Fire. The, 71
Cold on Iron and Steel Construction. The Effect of, 162
Construction tested in the Athletic-Club Fire. The, 27
Cold Weather. Delays in Building caused by the, 71, 134
Crerar Bequest. The, 72
Elephant Restaurant. A proposed, 48
Exhibition. (See EXHIBITION, CHICAGO.)
Fall of a partly-finished Building, 186
" " a Ruined Wall, 186
Fountain. The Columbus, 72
Garbage Nuisance. The, 185
Illinois Central Station. The New, 135
Letters from, 71, 134, 185
Monument. The Massacre, 72
Railroad Tracks, 135
Schiller Theatre. The, 72
School-houses. The Building of, 72, 135
Skeleton Building. The Origin of the System of, 33
Chillon. The Roof of the Castle of, 192
Chimney-flues. Plastering, 2
" piece of the old Town-hall at Bruges. The famous, 165
" stack Ventilation, 74
" Taking down a High, 176
China. Travelling in, 34
Chinese Cities. Filth in, 171
" Curios, 136, 152
Cholera. The Cause and Prevention of Asiatic, 162
Church at Bradford-on-Avon. The Saxon, 100
" Building in England. The Cost of Modern, 112
" of St. Mary, Oxford. Restoring the, 82, 160
" " the Rosary at Lourdes. The, 63
" " " Sacred Heart. The Eiffel Tower and the, 160
Churches in London. Pestilential, 31
Circulars, Catalogues and Advertisements, 49
City-hall Competition. The Davenport, Iowa, 145
" halls in New York. The Old and New, 50, 65, 161

Civil Service in France, 97
Clay as Roofing-material. Burned, 75
Cleansing Paper and Fabrics. Methods of, 18
Cleveland, Ohio. The Method of using the Fire-boat at, 182
Club and Three Architects. One, 128
Coal can do. What a Pound of, 143
" Required to Heat a House. The Amount of, 154
Cœcke, Flemish Architect. Peter, 166
Cold on Iron and Steel Construction. The Effect of, 161
" Storage Warehouse at the Chicago Exhibition. The, 135
" Weather interfering with Building in Chicago, 71, 134
" " Laying Brick in, 176
Collector. A Notable Book, 96
Colonial Work in Salem, 41
Columbian Exposition. World's. (See EXHIBITION, CHICAGO.)
Columbus Fountain in Chicago. The, 72
" Mosaic. A, 160
Comino-tree of Colombia. The, 143
Commission. A Disputed, 31
Comparative Municipal Building-laws, 8, 26, 90, 122, 168, 187
Competition. A New Jersey School-house, 18

COMPETITIONS:—

Copley Square, Boston. The Proposed Rearrangement of, 129, 177
Davenport, Iowa, City-hall. The, 145
Draughtsmen's Competitions. The Minnesota Chapter, A. I. A., 130
French Hospital in San Francisco. The, 44
Government Buildings, 44, 88, 114, 129
New York City-hall. The, 50, 65, 161
Compromise. An Architectural, 40
Concrete. A Bibliography of, 143
Construction, 6, 68, 102, 181
" A New Fireproof, 182
" and the Insurance Companies. Improved, 47
" Origin of the Chicago, 33
" tested in the Athletic Club Fire. The Chicago System of, 27
Convention of the American Institute of Mining Engineers. The, 170
" " " Ontario Association of Architects. The, 169
Cooling Railway Carriages in Tropical Countries, 47
Coöperative Tenement-building in Boston, 80
Copley Square, Boston. The Competition for the proposed Rearrangement of, 129, 177
Coppée on the Eiffel Tower. François, 47
Copper Age. The, 176
"Copper House." Mr. Poulson's, 182
Corner-stones. Robbing, 112
Country Houses. The Chilliness of English, 80
Court-house. The Cost of Tweed's, 79
" " Toronto, 57
Cremating Garbage, 48, 144, 155
Crerar Bequest to Chicago. The, 72
Crowds. Notes on the Weight of, 26
Curios. Chinese, 136, 152
Cyclorama of Kilauea. Painting the, 176

Davenport, Iowa, City-hall Competition. The, 145
Daylight in the Dwelling-house, 21, 47
Decoration of the Inaugural Ball-room in the Pension Building. The, 184
Decorations of the World's Fair Buildings. The Interior, 135
Decorative Arts at the Ecole des Beaux-Arts. The Chair of, 146
Defective Flues, 31
Dieulafoy and the Académie. Madame, 32
Dome of the Roman Pantheon. The, 33
Draining the Okefinokee Swamp, 46
Drain-ventilation, 73
Draughtsmen's Competitions of the Minnesota Chapter, A. I. A. The, 130
Dry-goods Stores. The Danger of Fire in the Great, 177
Duties and Responsibilities of Architects, 91
Dwelling-house. Daylight in the, 21, 47
Dynamite and Real-estate Values in Paris, 81

East. Latrines of the, 170
Ecole des Beaux-Arts. The Chair of Decorative Arts at the, 146
Education. A Century of French Art and, 61
Eiffel Tower and the Church of the Sacred Heart. The, 160
" " François Coppée on the, 47
Electric-cars in Boston. Victims of the, 18
" Ground-currents. Disasters caused by, 176
" lighting in Sofia, 96
Electric Mail-tube between New York and Brooklyn, 1
" Power from the Falls of Tivoli. The Transmission of, 34
" Wires. Fires due to, 95
" " The Dangers of Fire from, 28
Electricity as a Promoter of Vegetable Growth, 130
" Building at the World's Fair. The, 108
Elephant. A Stone, 43
" Restaurant. Chicago's proposed, 48
Enamel for Iron. A New, 7

ENGINEERING:—

Bridge. A Famous Wooden, 80
" Foundation. Wool for a, 32
" London. The Tower, 139
Canal. The Panama, 98
Draining the Okefinokee Swamp, 46
Electric Power. Transmission of, 98
Foundations of the Manhattan Life Insurance Co.'s New Building. The, 66, 111
Lock. A Dispute about building a, 1
Mail-tube between New York and Brooklyn. Electric, 1
Nicaragua and Panama Canals. The, 146
Quays at Marseilles. The, 144
Tivoli. The Transmission of Electric Power from the Falls of, 34
Water-works. A Curious Accident to the Toronto, 57, 107
Engineering Record on the Competition for the City-hall at Davenport, Iowa. The, 145
Engineers' Club of Philadelphia. The, 125, 174
Engineers. The Convention of the American Institute of Mining, 170
England. The Cost of Modern Church-building in, 112
" The Labor-market in, 159
English Country Houses. The Chilliness of, 80
" Humorist on American Architecture. An, 94
" Method of Obtaining Tenders. The, 93
Evolution of the Modern Fireplace. The, 25

EXHIBITION:—

Architectural League. The, 45, 79
Chicago (see below, EXHIBITION, CHICAGO).

EXHIBITION, CHICAGO:—

Administration Building. The, 107
Architectural Exhibit. Accepted Contributions to the, 186
Canadian Exhibits, 58, 106
Cold-storage Warehouse. The, 135
Cyclorama of Kilauea. Painting the, 175
Decorations of the Buildings. The Interior, 135
Electricity Building. The, 108
Fire. Protection against, 109
Frenchman on the World's Fair. A, 58
Ice-making Plant. The, 135
Japanese Dwarf Cedar. The, 159
Machinery Building. The, 108
Midway Plaisance. The, 59
Paintings. The Canadian, 107
Quadrangle. The Main, 107
Roofs of the Fair Buildings. The Injuries by Snow and Ice to the, 134
Sculptors' Work on the Buildings. The, 134
Woman's Building. The, 159
Yucatan Exhibit. The, 160

Fall of a partly-finished Building in Chicago, 186
" " a Ruined Wall in Chicago, 186
Falls of Tivoli. Utilizing the, 34
Figurettes. Chinese, 153
Filth in Chinese Cities, 171
Fire-boat at Cleveland, Ohio. The Method of using the, 182
" Departments. Insurance Companies and the Maintenance of, 6
" from Electric Wires. The Dangers of, 28
" in Boston. The Lincoln Street, 161
" " Great Retail Stores. The Danger of, 177
" " the Chicago Athletic Club Building. The Effect of the, 27
Fireplace. The Evolution of the Modern, 25
" Windows over the, 47
Fireproof Construction. A New, 182
" Materials at Berlin. Test of, 176
Fire-protection for the World's Fair, 109
" Some Curious Origins of, 96, 178
Fires. Causation of, 96, 178
" due to Electric Wires, 95
" in Boston a Stimulant to the Insurance Companies. The recent, 48
" " Chicago, 71
" " the United States, 76
Floor-space in Non-fireproof Buildings. Restricting the undivided, 161
Flues. Defective, 31
Flume at Fresno, Cal. A Timber, 128
Flying-machine. Professor Langley's, 179
Foundations of the Manhattan Life Insurance Co.'s New Building. The, 66, 111
Fountain in Chicago. The Columbus, 72
Fountains Work. How Luminous, 95
France. Civil Service in, 97
French Art and Education. A Century of, 61
" Hospital Competition in San Francisco. The, 44
Frenchman on the World's Fair and America. A, 58
French Mutual Defence Society wins a Lawsuit. The, 81
Frescos of the Paris Panthéon. The, 77
Front Foot. Selling City Land by the, 192
Fruit-stones. Chinese Carved, 153

Gallery of British Art. The Tate, 167
Garbage. Cremating, 48, 144, 155
" Crematory Test at Boston. A, 144
" Destructor at Oldham. The, 48
" Nuisance, Chicago. The, 185
Garden of the Taj. The, 112
Gartner. Friedrich von, 121
Gate-post Ball. The, 159
Gates of Munich. The, 120
General Conditions. The Validity of, 47
Georgia State-house. The, 13
German Spelling. Changes in, 66
Germany. Smokeless Combustion in, 112
" Town-gates in Southern, 119
Glazed Roofs proposed for London Streets, 178
Gold Medal of the R. I. B. A. Mr. Richard M. Hunt and the Royal, 145
Government Buildings. Competitions for, 44, 88, 114, 129
Grafton Gallery, London. The New, 157
Graphic Analysis of a Roof-truss, 15, 16
Ground-currents. Disasters caused by Electric, 176
" Rents in London. The Value of, 81
Guillotine. The First Experiments with the, 141

Hand-mills, 175
Hawthorne in Salem, 42
Heating English Country Houses, 80
" Houses. The Problem of, 154
"*Histoire des Ordres dans l'Architecture*," 158
Holland. Intelligence as it used to be in, 64
Home. An Architect's, 72
Hospital in San Francisco. The Competition for the French, 44
Hospitals of Paris. The, 141
Hôtel de Ville. The Size of the Paris, 79
House. A Fireproof, 184
" Daylight in the Dwelling, 21, 47
Houses. The Problem of Heating, 154
Hungarian Railways. The Zone Tariff on, 159
Hunt and the Royal Gold Medal of the R. I. B. A. Mr. Richard M., 145

Ice-making at the World's Fair, 135
Ile-de-France School of Architecture. The, 35, 51, 67, 83
Illinois Central Station in Chicago. The New, 135
Inaugural Ball-room in the Pension Building. The Decoration of the, 184
India. The Sewerage of Towns in, 16
Insurance Agent. An enterprising Russian, 18
" Companies and the Maintenance of Fire-departments, 6
" Companies' Mercantile Schedule. The, 113
" Companies. The Expenses of, 80
" Companies. The recent Fires in Boson and the, 49
International Prints. The Delayed, 145
Intra-mural Burial, 31
Iron. A New Enamel for, 7
" and Steel Construction. The Effect of Cold on, 162
Italian Architects. Sketches of, 138

Japanese Dwarf Cedar at the World's Fair. The, 159
" Latrines, 172
Joan of Arc, 77
Josses, 152
"*Journal of Architecture*," 126

Kilauea. Painting the Cyclorama of, 175
Klenze. Leo von, 121
Labor in Belgium. The Truth as to, 96
Labor-market in England. The, 159
Labor-union. A Millennial, 112
Lamp-post Ventilators, 74
Langley's Flying-machine. Professor, 179
Languedocian School of Architecture. The, 99, 115, 131
Lantern-slide Clubs, 65
Last Judgment. An old Wall-painting of the, 48
Latrines of the East, 170
Law. Architect, Owner and Builder before the, 3, 19, 85
Laws. Comparative Municipal Building, 8, 26, 90, 122, 168, 187
Laying Brick in Cold Weather, 176
Lay Secretary Proposed for the A. I. A. A, 65
League Exhibition. The Architectural, 45, 79
" The Architectural, 74, 158

LEGAL:—

Agency of the Architect Dependent on the Terms of the Contract with his Client. The, 145
Architect, Owner and Builder before the Law, 3, 19, 85
Burial-grounds. Rights in Private, 31
French Mutual Defence Society Wins a Law-suit. The, 81
General Conditions. The Validity of, 47
Referee under a Contract. The Rights of an Architect as Final, 1
Trade-union Rules. Builders not Bound by, 32
Lessees. The Punishment of De, 99
Létang. Proposed Memorial to Professor, 81
" The Late Professor, 14

LETTERS FROM:—

Australia, 169
Canada, 57, 106, 169
Chicago, 71, 134, 185
London, 166
San Francisco, 44
Washington, 45, 184
Light in the Dwelling-house, 21, 47
Lightning-conductors. Erecting and Testing, 188
"*Limes, Cements, Mortars and Concretes.*" "*Notes on,*" 142
Lock. A Dispute about Building a, 1

LONDON:—

Churches. Pestilential, 31
Glazed Roofs Proposed for Certain Streets, 178
Grafton Gallery. The new, 157
Ground-rents in. The Value of, 81
Letter from, 166
South Kensington Museum. The Completion of, 167
Street-system. Proposed Remodelling of the, 166
Tate Gallery of British Art. The, 167
Tower Bridge. The, 139
Long-leaf Pine, 109, 111
Lotto. Lorenzo, 123
Lourdes. The Church of the Rosary at, 63
Low Countries. Architecture of the, 147, 163, 179
Lowell. The Garbage Crematory at, 156
Luminous Fountains Work. How, 95
Lyceum Theatre, Sydney, N. S. W. The, 169

Macdonald. Sculptured Memorials of Sir John, 58
Machinery Building at the World's Fair. The, 108
Magnet. A Giant, 8
Mail-tube between New York and Brooklyn. Electric, 1
Maisonneuve in Montreal. The Proposed Monument to, 56
Manhattan Life Ins. Co.'s new Building. Clearing the Site for the, 130
Manhattan Life Ins. Co.'s new Building. The Foundations of the, 66, 111
Marbles. American *vs.* Foreign, 114
March of Ancona. The, 123
Marseilles. The Quays at, 144
Maspero and the Colossal Statue of Sesostris. M., 48
Massachusetts State-House. The Proposed Rebuilding of the, 17
Massacre Monument. The Chicago, 72
Materials. The Architect and his, 133
Mayeux, the new Professor of Decorative Composition at the Ecole des Beaux-Arts. M. Henri, 146
Mechanical Thumbs, 108
Melting Steel. The Temperature of, 48
Memorial Association of the District of Columbia. The, 114
" to Bishop Brooks. The Proposed, 97
" to Professor Létang. Proposed, 81
Memorials of Sir John Macdonald. Sculptured, 58
Mercantile Schedule. The Insurance Company's, 113
Mexico. Proposed Great Cathedral in, 71
"*Michelangelo.*" Symonds's "*Life of,*" 124
Midway Plaisance at the World's Fair. The, 59
"Mill-construction" for City Buildings, 161

Minnesota Chapter, A. I. A. The Draughtsmen's Competitions of the, 130
Modern Fireplace. The Evolution of the, 25
" Mosaic, 23
Montreal. The Proposed Monument to Maisonneuve in, 58
Monument. The Chicago Massacre, 72
" to Maisonneuve in Montreal. The Proposed, 58
Monuments. The Neglect of Paris, 95
Moreau-Vauthier, Sculptor. Death of, 187
Mormon Temple. The new, 125
Mortar. A Bibliography of, 143
Mosaic. A Marvellous, 160
" Modern, 23
Moscow. The big Bell at, 176
Mule-power. Painting by, 175
Munich. The Gates of, 120
Municipal Building Laws. Comparative, 8, 26, 90, 122, 168, 187

National Academy of Design Exhibition. The, 14
Neglect of Monuments in Paris, 95
New Jersey School-house Competition. A, 18
Newport, R. I. Burning of Mr. Cornelius Vanderbilt's House at, 47
NEW YORK:—
Architectural League. The, 94, 158
" " Exhibition. The, 45, 79
City-halls. The old and new, 50, 65, 161
Court-house. The Cost of Tweed's, 79
Cremating Garbage, 155
Mail-tube between Brooklyn and. Electric, 1
Manhattan Life Ins. Co.'s new Building. Clearing the Site for the, 130
Manhattan Life Ins. Co.'s new Building. The Foundations of the, 66, 111
National Academy of Design. The, 14
Sketch Club, 29, 109, 158
Statue of President Arthur by the Park Commissioners. The Refusal of the, 113
Vanderbilt's Gift to the American Fine Arts Society. Mr. G. W., 17
"*New York City.*" "*King's Handbook of,*" 158
Nicaragua Canal and the Panama Canal. The, 146
Nine Hours' Work for Ten Hours' Pay, 31

OBITUARY:—
Moreau-Vauthier, Sculptor, 187
Snell. George, Architect, 129
Thayer. S. J. F., Architect, 130
Office-help for Architects, 37, 117, 149
Okefinokee Swamp. Draining the, 46
Oldham. The Garbage Destructor at, 48
Ontario Association of Architects. The Convention of the, 169
Ossuary at Sizun, Finisterre. The, 126
Owner and Builder before the Law. Architect, 3, 19, 85
Oxford. St. Mary's Church, 82, 160

Pacific-Coast Bathing Establishment. A, 144
Painting by Mule-power, 175
Paintings for the World's Fair. Canadian, 58, 106
" in the Paris Panthéon. The, 77
Palladio, 138
Panama Canal Scandal. The, 97
" Canals. The Nicaragua and, 146
Pantheon. Late Discoveries Relating to the, 33
" The Frescos of the Paris, 77
Paper and Fabrics. Methods of Cleansing, 18
Pargeting Chimney-flues, 2
PARIS:—
Dynamite and Real-estate Values in, 81
Ecole des Beaux-Arts. The Chair of Decorative Arts at the, 146
Eiffel Tower and the Church of the Sacred Heart. The, 160
" " François Coppée on the, 47
Hospitals. The, 141
Hôtel de Ville. The Size of the, 79
Neglect of Monuments. The, 95
Panthéon. The Frescos of the, 77
"Printemps" Dry-goods Store. The Burning of the, 177
"*Paris Ignoré,*" 141
Park Commissioners. The Refusal of the Statue of President Arthur by the New York, 113
Party-line Quarrel. A, 25
Patagonia. An Emigration from Australia to, 169
Peary's Arctic Home. Lieutenant, 143
Pekin. The City of, 34
Penn Statue for the Philadelphia City-hall. The, 156
Pennsylvania Travelling-Scholarship. The University of, 177
Pension Building. The Decoration of the Inaugural Ball-room in the, 184
PHILADELPHIA:—
Penn Statue for the new City-hall. The, 156
T-Square Club, 77, 158
Pine. Effect of Turpentine Gathering on the Timber of Long-leaf, 109
Pipe. Curious Accident to an Intake, 48
Plastering Chimney-flues, 2
Pohick Church planned by Washington. The, 192
Portico of Agrippa and the Pantheon. The, 33
Poulson's "Copper-house." Mr., 182
Pound of Coal can do. What a, 144
Practices. Unprofessional, 28
Private Burial-grounds. The Right to Maintain, 31
Proposals on Behalf of a Client. The Acceptance by an Architect of, 145
Public Buildings. A Distinction in the Acoustic Properties of, 9

Quadrangle at the World's Fair. The Main, 107
Quays at Marseilles. The, 144
Quernes, 175

Railroad Tracks in Chicago, 135
"*Railroads.*" "*Buildings and Structures of American,*" 125
Railway-carriages in Tropical Countries. Cooling, 47
Railways. The Zone Tariff on Hungarian, 159
Rameses II. A Colossal Statue of, 48
Range-boilers. Safety-valves on, 32
Real-estate Value. The Unit of, 192
" Values in Paris. Dynamite and, 81
Rebates on Insurance Rates for Safeguards against Fire, 113
Referee. The Perils of a, 128
" Under a Contract. The Rights of an Architect as Final, 1
Refrigeration. Carbonic Acid Applied to, 180
Renaissance Architecture in Belgium, 164
Responsibilities of Architects. Duties and, 91
Restaurant. Chicago's Proposed Elephant, 48
Restorations on the Church of St. Mary at Oxford. Restoring the, 82, 160
Retempering Cement, 33
REVIEWS:—
"Advanced Building Construction," 158
"*Histoire des Ordres dans l'Architecture,*" 158
"*L'Archéologie Chrétienne,*" 140
"Journal of Architecture," 125
"Michelangelo." Symonds's Life of, 124
"New York City." "King's Handbook of," 158
"Notes on Limes, Cements, Mortars and Concretes," 142
"*Paris Ignoré,*" 141
"Railroads." "Buildings and Structures of American," 125
"Stones for Building and Decoration," 142
"*Styles Français.*" "*Les,*" 140
R. I. B. A. Mr. Richard M. Hunt and the Royal Gold Medal of the, 145
Robbing Corner-stones," 112
Roger Williams in Salem, 43
Romanesque Architecture in Belgium, 147
Rome. Late Discoveries Relating to the Pantheon at, 33
Roof of the Castle of Chillon. The, 192
" Truss. Graphic Analysis of a, 15, 16
Roofing Material. Burned Clay as, 75
Roofs for City Streets. Glazed, 178
" of the World's Fair Buildings. Injuries by Snow and Ice to the, 134
Rotunda of the Pantheon. The, 33
Ruins of the Temple of Baal, 32
Russia. Filth in, 173
Russian Insurance Agent. An Enterprising, 18

Safety-valves on Range Boilers, 32
St. Bridget. The Remains of, 192
St. Denis. The Abbey of, 53
" Mary, Oxford. Restoring the Restorations on the Church of, 82, 160
" Paul's Cathedral, Calcutta, 62
" Thegonnec, Finisterre. The Church of, 126
Salem. Six Hours in, 41
Saltpetering of Brickwork. The, 30
SAN FRANCISCO:—
French Hospital Competition. The, 44
Letter from, 44
Statues of. The, 44
SANITARY:—
Atmosphere in School-rooms. Testing the, 2
Burial. The Evils of Intramural, 32
Cellar or no Cellar? 127
Cremating Garbage, 48, 144, 155
Garbage-crematory Test at Boston. A, 144
Garbage Destructor at Oldham. The, 48
" Nuisance in Chicago. The, 185
Latrines of the East, 170
Sepulture. Modern, 111
Sewerage of Level Towns. The, 16
Ventilated Roofs and Floors, 192
Ventilation. Houses and Sewer, 73
Water-supply of Cities. Protecting the, 162
Savannah Garbage Crematory. The, 156
Saxon Church at Bradford-on-Avon. The, 100
Schedule. The Insurance Company's Mercantile, 113
Schiller Theatre, Chicago. The, 72
Scholarship. The University of Pennsylvania Travelling, 177
School-house Competition. A New Jersey, 18
School-houses. The Building of Chicago, 72, 135
School-rooms. Testing the Air in, 2
Schwanthaler, 121
Sculptors' Work for the Chicago Exhibition Buildings. The, 134
Secretaryship of the A. I. A. The, 65
Sepulture. Modern, 111
Sesostris. A Colossal Statue of, 48
Sewer Ventilation, 73
Sewerage of Level Towns. The, 16
Shades and Shadows. Architectural 54
Shopping in great Stores. The Danger from Fire attending, 177
Siemens. Anecdote of Dr. Werner von, 89
" The Late Dr. Werner von, 1
Six Hours in Salem, 41
Skeleton Building. The Origin of the Chicago System of, 33
Sketches of Italian Architects, 139
"Slow-burning" Construction, 161
Smith. The Late Adrian W., 31
Smoke-nuisance. Cures for the, 176
Smokeless Combustion in Germany, 112
Snell, Architect. Death of George, 129
Snow and Ice on the Roofs of the World's Fair Buildings. Injuries by, 134
Soapstone Figures. Chinese, 152
Sofia. The Development of the City of, 98
Sound. The Transmission of, 9
South Kensington Museum. The Completion of, 167
Southern Capitols. Some, 13
Specification. An Early, 43
Spelling. Changes in German, 66
Stables. The Ventilation of, 73
Starr King and other San Francisco Statues. The, 44
State-House at Atlanta, Ga. The, 13
" The Proposed Rebuilding of the Massachusetts, 17
Statue of President Arthur by the New York Park Commissioners. The Refusal of the, 113
Statues. Malevolent, 48
Steel Construction. The Effect of Cold on Iron and, 162
Steel-frame Construction. The Origin of, 33
Steel. The Temperature of Melting, 48
Stevens Bicycle Tour. The, 174
Stone. A Bibliography of Building, 142
" to Canadian Master Stone-cutters. The Price of, 57
" Elephant. A, 43
" The Qualities of Building, 82
"*Stones for Building and Decoration,*" 142
Stones. The Selection of Suitable Building, 133
Street-system of London. Plan for Remodelling the, 166
"*Styles Francais.*" "*Les,*" 140
Swamp. Draining the Okefinokee, 46
Swords. Chinese, 136

Taj. The Garden of the, 112
Tarsney Bill and Government Architecture. The, 44, 88, 114, 129
Tate Gallery of British Art. The, 167
Tea-root Carvings. Chinese, 153
Telegraph-construction Work of the Siemens Brothers. The, 2
Temperature of Melting Steel. The, 48
Temple of Baal. Ruins of the, 32
Tenders. The English Method of Obtaining, 93
Tenement-building in Boston. Coöperative, 80
Ten Hours' Pay. Nine Hours' Work for, 31
Thayer, Architect. Death of S. J. F., 130
Theatre. An Australian, 169
" Chicago. The Schiller, 72
Thumbs. Mechanical, 108
Tiles. Roofing, 75
Timber Examinations and Tests. The U. S., 110
" Flume at Fresno, Cal. A, 128
Tin-lined Tubes. Defects in, 128
Tivoli. Utilizing the Falls of, 34
Toronto Court-house. The, 57
" Water-works. A Curious Accident to the, 57, 107
Toulouse. The Architecture of, 99, 131
Tower Bridge, London. The, 139
Town-Gates in Southern Germany, 119
Trade Surveys, 16, 32, 48, 64, 80, 96, 112, 144, 160, 176, 192
Trade-union Rules. Builders not Bound by, 32
Travelling-Scholarship. The University of Pennsylvania, 177
Trinity Church, Boston. The Completion of, 97
Trolley in Boston. Victims of the, 18
Truss. Graphic Analysis of a Roof, 15, 16
Tubes. Defects in Tin-lined, 128
Turpentine Gathering on the Timber of Long-leaf Pine. Effect of, 109
Tweed's Court-house. The Cost of, 79
Typhoid Fever Epidemics. Causes of, 162

United States Timber Examinations and Tests. The, 110
University College, Liverpool, 191
" of Pennsylvania Travelling-Scholarship. The, 177
Unprofessional Practices, 28

Vanderbilt's Gift to the American Fine Arts Society. Mr. G. W., 17
" House at Newport, R. I. Burning of Mr. Cornelius, 47
Vegetable Growth by Electric Currents. The Promotion of, 130
Venetian Mosaic, 160
Ventilated Roofs and Floors, 192
Ventilation, 73
Villa Capra. Palladio's, 139
Vredeman, Flemish Architect. Hans, 179
Vriendt, Flemish Architect. Cornelis de, 166

Wall-painting Found. An Old, 48
WASHINGTON:—
Decoration of the Inaugural Ball-room in the Pension Building. The, 184
Letters from, 45, 184
Memorial Association of the District of Columbia. The, 114
Pohick Church planned by Washington, 192
Water Absorbed by Bricks, 135
Water-backs, 167
Water-closets. Eastern, 170
Water-gas Plant. The History of an English, 82
Waterproof Floors, 113
Water-works. A Curious Accident to the Toronto, 57, 107
Weight of Crowds. Notes on the, 26
Wenhaston, England. An old Wall-painting found in the Church of, 48
White Ants, 116
Windows in the Dwelling-house, 21
" over the Fireplace, 47
Witchcraft. Salem, 41
Woman's Building at the World's Fair. The, 59
Wood. The Ravages of White Ants in, 116
Wooden Bridge. A Famous, 80
Wool for a Bridge Foundation, 32
Worcester County Society of Civil Engineers, 29
World's Fair, Chicago. (See EXHIBITION, CHICAGO.)

Yucatan Exhibit at the Chicago Exhibition. The, 160

Zone Tariff on Hungarian Railways. The, 159

ILLUSTRATIONS.

[The figures refer to the number of the journal, not to the page.]

APARTMENT-HOUSES.

Bachelor Apartments, Boston, Mass. Patrick A. Tracy, Architect, 899

ARMORIES.

Armory, Savannah, Ga. W. G. Preston, Architect, 890
Market and Armory, Portsmouth, Va. Carpenter & Peebles, Architects, 890
Proposed Armory, San Francisco, Cal. W. G. & C. R. Mitchell, Architects, 890

CLUB-HOUSES.

Competitive Design for Newton Club-house, Newton, Mass. S. J. Brown, Architect, 893
Newton Club-house, Newton, Mass. Hartwell & Richardson, Architects, 893

DETAILS.

Old Colonial Doorway, Albany, N. Y. 889

DWELLINGS.

Design for a City House. Moses & King, Architects, 899
Design for a Cottage. J. M. Uffinger, Architect, 899
House. Samuel Milligan, Architect, 892
House at:—
- Cynwyd, Pa. Mrs. Minerva Parker Nichols, Architect, 894
- Guadelupe, Mexico. Designed by C. Alois Herman, 897
- Overbrook, Pa. Horace Trumbauer, Architect, 896
- Wellesley Hills, Mass. W. A. Rodman, Architect, 896

House of:—
- George L. Allen, St. Louis, Mo. Eames & Young, Architects, 895
- D. B. Anderson, New Cumberland, W. Va. S. T. McClaren, Architect, 892
- Charles Benner, Setauket, N. Y. Lamb & Rich, Architects, 891
- W. K. Bixby, St. Louis, Mo. W. Albert Swasey, Architect, 896
- Robert Brown, Jr., Architect, Dorchester, Mass., 893
- Mrs. J. C. Coonley, Chicago, Ill. Pond & Pond, Architects, 890 (*Imp.*)

House of:—
- E. A. DeWolf, St. Louis, Mo. Eames & Young, Architects, 898
- Eugene Fellner, Brookline, Mass. Cram & Wentworth, Architects, 898
- Dr. C. A. Herter, New York, N. Y. Carrère & Hastings, Architects, 896
- Dr. Henry Hooper, Chicago, Ill. Burling & Whitehouse, Architects, 892 (*Imp.*)
- A. G. Loomis, Hartford, Conn. E. T. Hapgood, Architect, 899
- Crosby S. Noyes, near Silver Springs, Md. W. J. Marsh, Architect, 889
- S. Alexander Orr, Troy, N. Y. H. Langford Warren, Architect, 891 (*Imp.*)
- Theodore Roosevelt, Oyster Bay, L. I. Lamb & Rich, Architects, 895
- A. Schwarzmann, Shelter Island, N. Y. Wait & Cutter, Architects, 900
- J. B. Stetson, Ogontz, Pa. George T. Pearson, Architect, 894
- S. Taylor, near Winters, California. Percy & Hamilton, Architects, 889
- Henry D. Welsh, Wissahickon Heights, Germantown, Pa. G. W. & W. D. Hewitt, Architects, 894 (*Imp.*)
- George S. Willets, Chicago, Ill. W. R. Emerson, Architect, 898 (*Imp.*)

House on:—
- Lanark Road, Boston, Mass. E. L. Rogers, Architect, 900
- Jefferson Ave., Brooklyn, N. Y. Otto J. Gette, Architect, 900

Houses on North State Street, Chicago, Ill. Charles S. Frost & F. B. Townsend, Architects, 896 (*Imp.*)
Old Houses on Front St., Harrisburg, Pa., 893 (*Imp.*)
Proposed House for Wm. F. Forsyth, Winchester Mass. Wait & Cutter, Architects, 891
Sketch for a Country House, by Richard Williams, 896
Town House. B. F. Willis, Architect, 889

ECCLESIASTICAL.

Design for a Country Church. J. M. Uffinger, Architect, 899
First M. E. Church, Brooklyn, N. Y. John Welch, Architect, 895
Presbyterian Church, Mansfield, Pa. W. J. East, Architect, 890
Sketch for Proposed Presbyterian Church. W. J. East, Architect, 891
West End Presbyterian Church, New York, N. Y. Henry F. Kilburn, Architect, 889 (*Imp.*)

EDUCATIONAL.

Gymnasium for University of Virginia, Charlottesville, Va. Carpenter & Peebles, Architects, 897
Kindergarten for the Blind, Jamaica Plain, Mass. Walter R. Forbush, Architect, 892
Laboratory Building, Mt. Holyoke College, South Hadley, Mass. Earle & Fisher, Architects, 897
Public School Building, Savannah, Ga. G. L. Norrman, Architect, 891
Theological Seminary, Lancaster, Pa. J. C. Smith, Architect, 899

HOTELS.

Wissahickon Inn, Germantown, Pa. G. W. & W. D. Hewitt, Architects, 899 (*Imp.*)

INTERIORS.

Great Hall in House of J. B. Stetson, Ogontz, Pa. George T. Pearson, Architect, 894
Hall in House of N. Poulson, Bay Ridge, Long Island, N. Y., J. M. Farnsworth, Architect, 900

MERCANTILE.

Building Corner Kingston and Essex Sts., Boston, Mass. Winslow & Wetherell, Architects, 900
Competitive Design for:—
- Bank of Commerce Building, Buffalo, N. Y. Shepley, Rutan & Coolidge, Architects, 890
- Manhattan Life Insurance Building, New York, N. Y. S. D. Hatch, Architect, 890

Industrial Trust Company's Building, Providence, R. I. Stone, Carpenter & Willson, Architects, 894
International Trust Company's Building, Boston, Mass. W. G. Preston, Architect, 889
Old Colony Building, Chicago, Ill. Holabird & Roche, Architects, 898
Studio Building, St. Louis, Mo. Eames & Young, Architects, 889

MISCELLANEOUS.

Architectural Shades and Shadows, 892
Bird's-eye-view of Copley Square, Boston, Mass., 897
Competitive Designs for an Eads Memorial Entrance to the St. Louis Bridge, by the St. Louis Architectural Club, 895 (*Imp.*)
Design for a College Fraternity Chapter-house. Nolan, Nolan & Stern, Architects, 894
" " Toll-house. J. M. Uffinger, Architect, 899
Model Showing Method of Fireproof Construction Devised by N. Poulson, 900
Old Colonial Work, Salem, Mass. Drawn by Claude F. Bragdon, 891 (*Imp.*)
Sketches made during the Stevens Bicycle Tour, by Elmer Grey, 899 (*Imp.*)
" " by the *American Architect* Travelling-Scholar, 891 (*Imp.*)
Stable and Ambulance-station for City Hospital, Boston, Mass. E. M. Wheelwright, Architect, 896

MONUMENTAL.

Lincoln Monument, Chicago, Ill. Augustus St. Gaudens, Sculptor; Stanford White, Architect, 897 (*Imp.*)

PUBLIC.

Capitol and State Buildings, Harrisburg, Pa. Stephen Hills, Architect, 900 (*Imp.*)
Design for a Public Library. J. M. Uffinger, Architect, 899
Indiana State-house, Indianapolis, Ind. Edwin May, Architect, 895 (*Imp.*)
Lunatic Asylum, West Roxbury, Boston, Mass. E. M. Wheelwright, Architect, 897
Market and Armory, Portsmouth, Va. Carpenter & Peebles, Architects, 890
Public Library, Charlestown, N. H. C. C. McAlpine, Architect, 892
State Asylum for the Chronic Insane, Wernersville, Pa. Rankin & Kellogg, Architects, 891

RAILROAD.

Union Railroad Station, Portland, Me. Winslow & Wetherell, Architects, 895

TEXT CUTS.

[The figures refer to the page of text, not to the plates.]

Abo Cathedral, Finland, 139
Addition to Police Station, Jamaica Plain, Mass. E. M. Wheelwright, Architect, 93
Angels in Saxon Church, Bradford-on-Avon, 102
Apse of the Church of Triel, 83
Arches in Court of Town-hall, Nymegen, 181
Basse-œuvre, Beauvais, 35
Belfry of Bougival, 68
" " Donzac, 131
" " Le Taur, Toulouse, 131
" " St. Béat, 131
" " Urcel, 36
Bruges, 166
Capital from the Tuileries, 152
Carvings, Church of St. Gereon, Cologne, 154
Cathedral of Brussels, 148
" " Mantes, 67
" " Tournai, 147
Choir, Sens Cathedral, 52
Church of:—
- Brie-Comte-Robert, 84
- Celleneuve, 99
- St. Benoit-sur-Loire, 35
- St. Germer, 53
- St. Jean des Vignes, Soissons, 83
- The Rosary, Lourdes, 63

Cloisters at Moissac, 116
Competitive Design for an Evangelical Church, 3
Corbelling, Church of St. Waltrudis, Herenthals, 148
Cour d'Honneur, Château de Pau, France, 123
Cradle of the Duc de Bordeaux, 28
Custom-house, Salem, 42
Deambulatory of St. Louis, Poissy, 51
Design for Window for a Concert-hall, 73
Detail from the Tuileries, 107
Donjon of Châtillon-sur-Loing, 85
Door. Sixteenth Century, 157
Entrance to Hôtel Felzins, Toulouse, 132
" " House of B. H. Warder, Washington, D. C. H. H. Richardson, Architect, 27
Fenestral Tower, Uzes, 100
Fire-dog. Bronze, 91
Fragment of a Dutch Façade, 180
Gallows Hill, Salem, 41
Geminate Capital, 115
Halles, Bruges, 164
" Ypres, 164
House at Bruges, 165
" " Orleans, 84
House. Country, 155
House of the "Great Salmon," Mechlin, 180
House of the Physician, Chartres, 84
Houses on the Grande Place, Brussels, 180
Hunting Trophy, 138
Interior, Church of St. Loup-de-Naud, 53
Isar Thor, Munich, 120
Latrines. Eastern, 170, 171, 172, 173
Lid of a Fourteenth Century Casket, 187
Lion, in the Loggia dei Lanzi, Florence, 26
Lund Cathedral, Sweden, 88
Mayor's Chair, Deal, England, 188
Misereres, Amiens Cathedral, 25, 45, 61, 94, 109, 133
Palace of Versailles, 75
Panel. Eighteenth Century, 21
Pickering House, Salem, 42
Pingree House, Salem, 43
Porch of Church of the Rosary, Lourdes, 63
Portal at Ripoll, 115
" at Valcabrère, 115
" of St. Ayoul, Provins, 67
" " " Basile, Etampes, 36
" " " Peter's, Toulouse, 131
Propylæn, Munich, 121
Royal Chamber at Versailles, 85
St. Germain-des-Prés, Paris, 36
Salem. Back-yard, 42
Salem Frame-house. Typical, 43
Saloon in Schloss Bruchsal, 9
Saxon Church, Bradford-on-Avon, 100
Sendlinger Thor, Munich, 119
Sieges Thor, Munich, 120
Skipper House, Ghent, 165
Slaughter-house, Haarlem, 179
South Portal, Notre Dame d'Etampes, 67
Spiral Stairs, House of Jacques Cœur, Bourges, 136
Spire of Chartres Cathedral, 68
State-House, Atlanta, Ga., 13
Stone House, Toulouse, 132
"Temperance," from Tomb of Francis II, Nantes Cathedral, 40
Town-hall:—
- Alost, 163
- Antwerp, 166
- Kampen, 164
- Leyden, 178
- Louvain, 165
- Middelburg, 163
- Oudenaarde, 163
- The Hague, 179

Vaulting, Palace of the Thermæ, Paris, 35
Window, 37
Window-heads. Eighteenth Century, 19, 46, 58

ILLUSTRATIONS.—IMPERIAL EDITION.

[*The figures refer to the number of the journal, not to the page.*]

COLORED PRINTS.

Capitol and State Buildings, Harrisburg, Pa. Stephen Hills, Archt., 900
House of Dr. Henry Hooper, Chicago, Ill. Burling & Whitehouse, Architects, 892
Houses on North State St., Chicago, Ill. Charles S. Frost and F. B. Townsend, Architects, 896

GELATINE.

House of Mrs. J. C. Coonley, Chicago, Ill., Pond & Pond, Architects, 890

HOUSE OF:—
S. Alexander Orr, Troy, N. Y. H. Langford Warren, Architect, 891
Henry D. Welsh, Wissahickon Heights, Pa. G. W. & W. D. Hewitt, Architects, 894
George S. Willets, Chicago, Ill. W. R. Emerson, Architect, 898
Indiana State-House, Indianapolis, Ind. Edwin May, Architect, 895
Lincoln Monument, Chicago, Ill. Augustus St. Gaudens, Sculptor; Stanford White, Architect, 897
Old Houses on Front St., Harrisburg, Pa., 893
West End Presbyterian Church, New York, N. Y. Henry F. Kilburn, Architect, 889
Wissahickon Inn, Germantown, Pa. G. W. & W. D. Hewitt, Archts., 899

LITHOGRAPHIC.

Competitive Designs for an "Eads Memorial Entrance" to the St. Louis Bridge, by the St. Louis Architectural Club, 895
Doorway, Church of St. Martin, Alost, Belgium, 891
Fireplace in Museum, Brussels, Belgium, 891
Old Colonial Work, Salem, Mass. Drawn by Claude F. Bragdon, 891
Sketches by the *American Architect* Travelling-Scholar, 891
" made during the Stevens Bicycle Tour, by Elmer Grey, 899
Well, Bologna, Italy, 891

ADDITIONAL ILLUSTRATIONS.—INTERNATIONAL EDITION.

[*The figures refer to the number of the journal, not to the page.*]

APARTMENT-HOUSES.

Middle-class Flats, Hackney, London, Eng. Essex, Nicol & Goodman, Architects, 900

CHICAGO EXHIBITION.

Central Porch and Rotunda, and Details of the Same, Fisheries Building, World's Columbian Exhibition, Chicago, Ill. Henry Ives Cobb, Architect, 894 (*Gel.*)
" Southern Porch, Manufactures and Liberal Arts Building, World's Columbian Exhibition, Chicago, Ill. George B. Post, Architect, 891 (*Gel.*)
Fragment from the Columbia Fountain, World's Columbian Exhibition, Chicago, Ill. Frederick MacMonnies, Sculptor, 899 (*Gel.*)

COLORED PRINTS.

Church on Capitol Ave., Omaha, Neb. Walker & Kimball, Architects, 889
House of E. J. Martyn, Chicago, Ill. Jenney & Mundie, Architects, 898
" " E. H. Valentine, Chicago, Ill. Burnham & Root, Architects, 894

DETAILS.

Ambo in the Cathedral, Ravello, Italy, 889
Capital in the Cathedral, Monreale, Italy, 889
Choir Stalls, St. Paul's Cathedral, London, Eng., 892
Door and Fireplace in a Private House, Paris, France. M. Dezermaux, Architect, 895
Entrance Porch of West End Presbyterian Church, New York, N. Y. Henry F. Kilburn, Architect, 889 (*Gel.*)
" to Chapel of West End Presbyterian Church, New York, N. Y. Carrère & Hastings, Architects, 889 (*Gel.*)
Reredos of Church at Backford, Eng. Douglas & Fordham, Architects, 896
Staircase of Francis I, Château de Blois, France, 894
" Schloss Mirabell, Salzburg, Austria, 892
University College, Liverpool, Eng. A. Waterhouse & Son, Archts., 900

DWELLINGS.

Château de Martinsbourg, Mayence, Ger. Drawn by Prout, 898
Château de Pierrefonds, France, 895, 897
Design for a Villa. A. C. Walker, Architect, 890, 892
Fox Oak, Burhill, near Weybridge, Eng. Halsey Ricardo, Architect, 890, 891
Grantully Castle, Scotland, 889
House at 52 Cadogan Square, London, Eng. Ernest George & Peto, Architects, 897
" in Paris, France. G. Dezermaux, Architect, 891
" of E. J. Martyn, Chicago, Ill. Jenney & Mundie, Architects, 898 (*Gel.*)
" " E. H. Valentine, Chicago, Ill. Burnham & Root, Architects, 894 (*Gel*)
New Houses, Blackburn, Eng. Stones & Gradwell, Architects, 895
"Rosecourt," Romford, Eng. Davis & Emanuel, Architects, 899
Schloss Pflugensberg, near Eisenach, Ger. Neher & Von Kauffman, Architects, 900
Summer Residence, Point Lonsdale, Australia. A. C. Walker, Archt., 890
Villa at Champrosay, France. Tropey Bailly, Architect, 898

ECCLESIASTICAL.

All Saints' Church, Hertford, Eng. Paley, Austin & Paley, Archts., 892
Ancient Cathedral of Cambrai, France, The, 892
Cathedral, Calcutta, India, 892
" Frankfort, Ger. Drawn by Prout, 900
" Mayence, Ger. Drawn by Prout, 896
Church at Knaith, Eng. Restoration by W. Watkins, Archt., 889
" of St. Thegonnec, Finisterre, France, 896
" " the Rosary, Lourdes France. M. Hardy, Architect, 892, 896
" on Capitol Avenue, Omaha, Nebraska. Walker & Kimball, Architects, 889
Competitive Design for St. Luke's Church, Winnington, Eng. Eden & Williams, Architects, 900
Dome of the Cathedral, Marseilles, France. M. Vaudoyer, Archt., 892
ynagogue, Hampstead, London, Eng. Delissa Joseph, Architect, 898
Two Churches in Corneto, Italy. Drawn by J. A. Slater, 890

EDUCATIONAL.

Design for an Oxford University-Extension College. C. R. Ashbee, Archt., 897
Design for Technical Schools, Manchester, Eng. Ernest Rüntz, Architect, 891
Sandhill School, Launceston, Tasmania. A. C. Walker, Architect, 892
University College, Liverpool, Eng. A. Waterhouse & Son, Architects, 900

FOUNTAINS.

Fontaine d'Amboise, Clermont-Ferrand, France, 899
Fountain at Fontenay-le-Comte, France, 893

GELATINE.

Central Porch and Rotunda, and Details of the Same, Fisheries Building, World's Columbian Exhibition, Chicago, Ill. Henry Ives Cobb, Architect, 894
" Southern Porch, Manufactures and Liberal Arts Building, World's Columbian Exhibition, Chicago, Ill. George B. Post, Architect, 891
Entrance Porch of West End Presbyterian Church, New York, N. Y. Henry F. Kilburn, Architect, 889
" to Chapel of West End Presbyterian Church, New York, N. Y. Carrère & Hastings, Architects, 889
Fragment from the Columbia Fountain, World's Columbian Exhibition, Chicago, Ill. Frederick MacMonnies, Sculptor, 899
House of E. J. Martyn, Chicago, Ill. Jenney & Mundie, Architects, 898
" " E. H. Valentine, Chicago, Ill. Burnham & Root, Architects, 894
Tomb of August Belmont, Newport, R. I. R. M. Hunt, Architect, 890
" " Ann Maria Smith, Newport, R. I. Stanford White, Architect, Louis St. Gaudens, Sculptor, 890

INTERIORS.

Church at Knaith, England. Restoration by W. Watkins, Archt., 889
Interior of the Church of the Rosary, Lourdes, France. M. Hardy, Architect, 896
Synagogue, Hampstead, London, Eng. Delissa Joseph, Architect, 898

MERCANTILE.

Anglo-Californian Bank, London, Eng. F. Roberts, Architect, 898
Lloyd's Bank, Bexhill-on-Sea, Eng. Arthur Wells, Architect, 896
New Premises, Sloane Square, London, Eng. Fred G. Knight, Archt., 892
Offices, Lawrence Lane, London, Eng. H. E. Knight, Archt., 892
Shops in Mount St., London, Eng. A. J. Bolton, Architect, 900
West End Branch, Credit Lyonnais, London, Eng. Davis & Emanuel, Architects, 896

MISCELLANEOUS.

"Fall of Babylon," from the Painting by Georges Rochegrosse. "The," 896
"Joan of Arc." Wall-painting by J. E. Lenepveu in the Panthéon, Paris, 893
Ossuary at Sizun, Finisterre, France, 896
St. Frideswide's Mission-house, Poplar, London, Eng. J. & S. F. Clarkson, Architects, 899
Saratoga Bathing-establishment, Saratoga, N. Y. Fuller & Wheeler, Architects, 897
"Seasons." Wall-paper designed by W. S. Black. "The," 896
Seal of La Société des Architectes du Poitou et de la Saintonge, France, 895

MONUMENTAL.

Roman Pillar, Igel, Ger. Drawn by Prout, 899
Tomb of August Belmont, Newport, R. I. R. M. Hunt, Architect, 890 (*Gel.*)
" " Ann Maria Smith, Newport, R. I. Stanford White, Architect, Louis St. Gaudens, Sculptor, 890 (*Gel.*)

PUBLIC.

Courts-of-Justice, Frankfort, Ger., 900
Imperial Institute, London, Eng. T. E. Collcutt, Architect, 893
Maison Communale, Cruybeke, Belgium. W. C. Brangwyn, Architect, 892
Tate Central Library, Brixton, London, Eng. Sidney Smith, Architect, 894
Town-hall, Bolsward, Holland, 900

TOWERS AND SPIRES.

Proposed Clock-tower, Walton-on-the-Naze, Eng. J. S. Moye, Architect, 895

INDEX BY LOCATION.

[*The figures refer to the number of the journal, not to the page, and the Edition is indicated in italic abbreviation.*]

Albany, N. Y. Old Colonial Doorway, 889 (*Reg.*)
Alost, Belgium. Church Doorway, 891 (*Imp.*)
Backford, England. Reredos of Church. Douglas & Fordham, Architects, 896 (*Int.*)
Bay Ridge, L. I., N. Y. Hall in House of N. Poulson. J. M. Farnsworth, Architect, 900 (*Reg.*)
Bexhill-on-Sea, England. Lloyd's Bank. Arthur Wells, Architect, 896 (*Int.*)
Blackburn, England. New Houses. Stones & Gradwell, Architects, 895 (*Int.*)
Blois, France. Staircase of Francis I, Château de, 894 (*Int.*)
Bologna, Italy. Well, 891 (*Imp.*)
Bolsward, Holland. Town-hall, 900 (*Int.*)

Boston, Mass.:—

Bachelor Apartments. Patrick A. Tracy, Architect, 899 (*Reg.*)
Bird's-eye-view of Copley Square, 897 (*Reg.*)
Building Corner of Kingston and Essex Sts. Winslow & Wetherell, Architects, 900 (*Reg.*)
House on Lanark Road. E. L. Rogers, Architect, 900 (*Reg.*)
International Trust Company's Building. W. G. Preston, Architect, 889 (*Reg.*)
Lunatic Asylum, West Roxbury. E. M. Wheelwright, Architect, 897 (*Reg.*)
Stable and Ambulance-station for City Hospital. E. M. Wheelwright, Architect, 896 (*Reg.*)

Brookline, Mass. House of Eugene Fellner. Cram & Wentworth, Architects, 898 (*Reg.*)
Brooklyn, N. Y. First M. E. Church. John Welch, Architect, 895 (*Reg.*)
" " Houses on Jefferson Ave. Otto J. Gette, Architect, 900 (*Reg.*)
Brussels, Belgium. Fireplace in Museum, 891 (*Imp.*)
Buffalo, N. Y. Competitive Design for Bank of Commerce Building. Shepley, Rutan & Coolidge, Architects, 890 (*Reg.*)
Calcutta, India. The Cathedral, 892 (*Int.*)
Cambrai, France. The Ancient Cathedral of, 892 (*Int.*)
Champrosay, France. Villa. Tropey Bailly, Architect, 898 (*Int.*)
Charlestown, N. H. Public Library. C. C. McAlpine, Architect, 892 (*Reg.*)
Charlottesville, Va. Gymnasium for University of Virginia. Carpenter & Peebles, Architects, 897 (*Reg.*)

Chicago, Ill.:—

Central Porch and Rotunda, and Details of the Same, Fisheries Building, World's Columbian Exhibition. Henry Ives Cobb, Architect, 894 (*Int.*)
Central Southern Porch, Manufactures and Liberal Arts Building, World's Columbian Exhibition. George B. Post, Architect, 891 (*Int.*)
Fragment from the Columbia Fountain, World's Columbian Exhibition. Frederick MacMonnies, Sculptor, 899 (*Int.*)
House of Mrs. J. C. Coonley. Pond & Pond, Architects, 890 (*Imp.*)
" " Dr. Henry Hooper. Burling & Whitehouse, Architects, 892 (*Imp.*)

Chicago, Ill.:—

House of E. J. Martyn. Jenney & Mundie, Archts., 898 (*Int.*)
" " E. H. Valentine. Burnham & Root, Archts., 894 (*Int.*)
" " George S. Willets. W. R. Emerson, Architect. 898 (*Imp.*)
Houses on North State St. Charles S. Frost & F. B. Townsend, Architects, 896 (*Imp.*)
Lincoln Monument. Augustus St. Gaudens, Sculptor; Stanford White, Architect, 897 (*Imp.*)
The Old Colony Building. Holabird & Roche, Architects, 898 (*Reg.*)

Clermont-Ferrand, France. Fontaine d'Amboise, 899 (*Int.*)
Corneto, Italy. Two Churches. Drawn by J. A. Slater, 890 (*Int.*)
Cruybeke, Belgium. Maison Communale. W. C. Brangwyn, Architect, 892 (*Int.*)
Cynwyd, Pa. House. Mrs. Minerva Parker Nichols, Architect, 894 (*Reg.*)
Dorchester, Mass. House of Robert Brown, Jr., Architect, 893 (*Reg.*)
Eisenach, Germany. Schloss near Pflugensberg. Neher & Von Kauffman, Architects, 900 (*Reg.*)
Fontenay-le-Comte, France. Fountain, 893 (*Int.*)
Frankfort, Germany. The Cathedral, 900 (*Int.*)
" " Courts of Justice, 900 (*Int.*)
Germantown, Pa. Wissahickon Inn. G. W. & W. D. Hewitt, Architects, 899 (*Imp.*)
Grantully Castle, Scotland, 889 (*Int.*)
Guadelupe, Mexico. House. Designed by C. Alois Herman, 897 (*Reg.*)
Hartford, Conn. House of A. G. Loomis. E. T. Hapgood, Architect, 899 (*Reg.*)
Harrisburg, Pa. Capitol and State Buildings. Stephen Hills, Architect, 900 (*Imp.*)
" " Old Houses on Front St., 893 (*Imp.*)
Hertford, England. All Saints' Church. Paley, Austin & Paley, Architects, 892 (*Int.*)
Igel, Germany. Roman Pillar. Drawn by Prout, 899 (*Int.*)
Indianapolis, Ind. Indiana State-house. Edwin May, Architect, 895 (*Imp.*)
Jamaica Plain, Mass. Kindergarten for the Blind. Walter R. Forbush, Architect, 892 (*Reg.*)
Knaith, England. Restoration of Knaith Church. W. Watkins, Architect, 889 (*Int.*)
Lancaster, Pa. Theological Seminary. J. C. Smith, Architect, 899 (*Reg.*)
Launceston, Tasmania. Sandhill School. A. C. Walker, Architect, 892 (*Int.*)
Liverpool, England. University College. A. Waterhouse & Son, Architects, 900 (*Reg.*)

London, Eng.:—

Anglo-Californian Bank. F. Roberts, Architect, 898 (*Int.*)
Choir Stalls, St. Paul's Cathedral, 892 (*Int.*)
House at 52 Cadogan Sq. Ernest George & Peto, Architects, 897 (*Int.*)
Imperial Institute. T. E. Collcutt, Architect, 893 (*Int.*)
Middle-class Flats, Hackney. Essex, Nicol & Goodman, Archts, 900 (*Int.*)
New Premises, Sloane Square. Fred. G. Knight, Architect, 892 (*Int.*)
Offices, Lawrence Lane. H. E. Knight, Architect, 892 (*Int.*)

London, Eng.:—

St. Frideswide's Mission-house, Poplar. J. & S. F. Clarkson, Architects, 899 (*Int.*)
Shops in Mount St. A. J. Bolton, Architect, 900 (*Int.*)
Synagogue at Hampstead. Delissa Joseph, Architect, 898 (*Int.*)
Tate Central Library. Sidney Smith, Architect, 894 (*Int.*)
West End Branch, Credit Lyonnais. Davis & Emanuel, Architects, 896 (*Int.*)

Lourdes, France. Church of the Rosary. M. Hardy, Architect, 892, 896 (*Int.*)
Manchester, England. Design for Technical Schools. Ernest Rüntz, Architect, 891 (*Int.*)
Mansfield, Pa. Presbyterian Church. W. J. East, Architect, 890 (*Reg.*)
Marseilles, France. Dome of the Cathedral. M. Vaudoyer, Architect, 892 (*Int.*)
Mayence, Germany. Château de Martinsbourg. Drawn by Prout, 898 (*Int.*)
" " The Cathedral. Drawn by Prout, 896 (*Int.*)
Monreale, Italy. Capital in the Cathedral, 889 (*Int.*)
New Cumberland, W. Va. House of D. B. Anderson. S. T. McClaren, Architect, 892 (*Reg.*)

Newport, R. I.:—

Tomb of August Belmont. R. M. Hunt, Architect, 890 (*Int.*)
" " Ann Maria Smith. Stanford White, Architect; Louis St. Gaudens, Sculptor, 890 (*Int.*)

Newton, Mass. Competitive Design for Newton Club-house. S. J. Brown, Architect, 893 (*Reg.*)
" " Newton Club-house. Hartwell & Richardson, Architects, 893 (*Reg.*)

New York, N. Y.:—

Competitive Design for Manhattan Life Insurance Building. S. D. Hatch, Architect, 890 (*Reg.*)
Entrance to Chapel of West End Presbyterian Church. Carrère & Hastings, Architects, 889 (*Int.*)
House of Dr. C. A. Herter. Carrère & Hastings, Architects, 896 (*Reg.*)
West End Presbyterian Church. Henry F. Kilburn, Architect, 889 (*Imp.*)
Entrance Porch of Same, 889 (*Int.*)

Ogontz, Pa. House of J. B. Stetson. George T. Pearson, Architect, 894 (*Reg.*)
Omaha, Neb. Church on Capitol Avenue. Walker & Kimball, Architects, 889 (*Int.*)
Overbrook, Pa. House. Horace Trumbauer, Architect, 898 (*Reg.*)
Oyster Bay, L. I. House of Theodore Roosevelt. Lamb & Rich, Architects, 895 (*Reg.*)
Paris, France. Door and Fireplace in a Private House. M. Desermaux. Architect, 895 (*Int.*)
" " History of Joan of Arc. Wall-painting by J. E. Lenepveu in the Panthéon, 893 (*Int.*)
" " House. M. G. Desermaux, Architect, 891 (*Int.*)
Philadelphia, Pa. House of Henry D. Welsh, Wissahickon Heights. G. W. & W. D. Hewitt, Architects, 894 (*Imp.*)

Pierrefonds, France. The Château, 895, 897 (*Int.*)
Point Lonsdale, Australia. Summer Residence. A. C. Walker, Architect, 890 (*Int.*)
Portland, Me. Union Railroad Station. Winslow & Wetherell, Architects, 895 (*Reg.*)
Portsmouth, Va. Market and Armory. Carpenter & Peebles, Architects, 890 (*Reg.*)
Providence, R. I. Industrial Trust Company's Building. Stone, Carpenter & Willson, Architects, 894 (*Reg.*)
Ravello, Italy. Ambo in the Cathedral, 889 (*Int.*)
Romford, England. "Rosecourt." Davis & Emanuel, Architects, 899 (*Int.*)

St. Louis, Mo.:—

House of George L. Allen. Eames & Young, Architects, 895 (*Reg.*)
" " E. A. DeWolf. Eames & Young, Architects, 898 (*Reg.*)
" " W. K. Bixby. W. Albert Swasey, Architect, 896 (*Reg.*)
Studio Building. Eames & Young, Architects, 889 (*Reg.*)

St. Thegonnec, Finisterre, France. Church, 896 (*Int.*)
Salem, Mass. Old Colonial Work. Drawn by Claude F. Bragdon, 891 (*Imp.*)
Salzburg, Austria. Staircase, Schloss Mirabell, 892 (*Int.*)
San Francisco, Cal. Proposed Armory. W. G. & C. R. Mitchell, Architects, 890 (*Reg.*)
Saratoga, N. Y. Bathing Establishment. Fuller & Wheeler, Architects, 897 (*Int.*)
Savannah, Ga. Armory. W. G. Preston, Architect, 890 (*Reg.*)
" " Public School Building. G. L. Norrman, Architect, 891
Setauket, N. Y. House of Charles Benner. Lamb & Rich, Architects, 891
Shelter Island, N. Y. House of A. Schwarzmann. Wait & Cutter, Architects, 900 (*Reg.*)
Silver Spring, Md. House of Crosby S. Noyes, Near. W. J. Marsh, Architect, 889 (*Reg.*)
Sizun, Finisterre, France. Ossuary at, 896 (*Int.*)
South Hadley, Mass. Laboratory Building, Mt. Holyoke College. Earle & Fisher, Architects, 897 (*Reg.*)
Troy, N. Y. House of S. Alexander Orr. H. Langford Warren, Architect, 891 (*Imp.*)
Walton-on-the-Naze, England. Proposed Clock-tower. J. T. Moye, Architect, 895 (*Int.*)
Wellesley Hills, Mass. House. W. A. Rodman, Architect, 896 (*Reg.*)
Wernersville, Pa. State Asylum for the Chronic Insane. Rankin & Kellogg, Architects, 891 (*Reg.*)
Weybridge, England. Fox Oak, Burhill, Near. Halsey Ricardo, Architect, 890, 891 (*Int.*)
Winchester, Mass. Proposed House for Wm. F. Forsyth. Wait & Cutter, Architects, 891 (*Reg.*)
Winnington, England. Competitive Design for St. Luke's Church. Eden & Williams, Architects, 900 (*Int.*)
Winters, California. House of S. Taylor, Near. Percy & Hamilton, Architects, 889 (*Reg.*)

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CONTENTS

SUMMARY: —
Electric Mail-tube between New York and Brooklyn. — The Rights of an Architect as final Referee under a Contract. — The late Dr. Werner von Siemens. — Testing the Atmosphere in School-rooms. — An Engineer's Suggestion as to Chimney-building. — The Pargeting of Chimney-flues. . . 1
ARCHITECT, OWNER AND BUILDER BEFORE THE LAW. — XXVI. 3
CONSTRUCTION. — XVIII. 6
COMPARATIVE MUNICIPAL BUILDING LAWS. — XIX. 8
A DISTINCTION IN THE ACOUSTIC PURPOSES OF PUBLIC BUILDINGS. 9
SOME SOUTHERN CAPITOLS: GEORGIA. — V. 13
SOCIETIES. 14
ILLUSTRATIONS: —
The West End Presbyterian Church, Corner Amsterdam Avenue and 105th St., New York, N. Y. — The International Trust Company's Building, Boston, Mass. — Studio Building, St. Louis, Mo. — House at Winters, Cal. — Old Colonial Doorway, Albany, N. Y. — Town House. — House at Silver Spring, Md.
Additional: Church on Capitol Ave., Omaha, Neb. — Porch of the West End Presbyterian Church, New York, N. Y. — Entrance to the Chapel of the Same. — Grantully Castle. — Capital in Nave of the Cathedral, Monreale, Sicily. — Ambo in the Cathedral Ravello. — Knaith Church Restoration. 14
COMMUNICATIONS: —
Graphic Analysis of a Roof Truss. 15
NOTES AND CLIPPINGS. 16
TRADE SURVEYS. 16

A NEW sort of conduit for carrying letters is to be tried between New York and Brooklyn. For many years mail-pouches have been transported between the main post-office and the up-town branches by means of pneumatic tubes, laid under the streets, but there are difficulties in the way of carrying pneumatic tubes across the East River, and, until now, the mails have been transported between the two cities only by means of wagons. It is now proposed to improve the service by the ingenious process of laying a pipe over the East River bridge, with its approaches, and constructing within the tube a tiny electric railway, in which are to run cylindrical cars, large enough to take a mail-pouch, and each furnished with a small electric motor, taking current by means of a trolley. It is estimated that a speed of a hundred miles an hour can be attained, which would be sufficient to take a mail-pouch from New York to the Brooklyn post-office in less than a minute. The scheme appears quite practicable, and the only objectionable thing that we have read about it is that the post-master of Brooklyn is said to be engaged in financiering the company which is to build the line. The impropriety of this, supposing the story to be true, is so obvious that the company is likely to find difficulty in gaining the confidence of the public, but the experiment, if carried out, as now seems probable, will be interesting.

AN interesting question of the rights of an engineer or architect as final referee under a contract was decided by the highest court in England a few weeks ago. A contractor named Jackson agreed to build a lock for the Barry Railway Company, and the contract between the company and the contractor provided that any dispute should be referred to the company's engineer, whose decision should be conclusive and binding upon both parties. A dispute arose as to whether the walls of the lock should be built of stone, or of a certain rocky marl, the engineer demanding stone, and the contractors claiming that they should be allowed to use the marl all through the work. The company referred the question to the engineer's decision, as the contract provided, but the contractor objected to this, on the ground that the engineer, Mr. J. Wolfe Barry, had already expressed himself, in correspondence, in a manner which showed that he had previously made up his mind on the point in dispute, and was therefore not fit to act in a judicial capacity in regard to it. As the company insisted, the contractor applied for an injunction to restrain the company from proceeding with the settlement of the dispute in this way. The letter which was offered in evidence, as showing most clearly that Mr. Barry had made up his mind on the subject, was one written by him after the serving of the writ, in which he said, "I have already stated in my previous letters that there was never any intention to construct the breakwater in any way differently from the others — namely, exclusively of stone filling, with protecting stones on the outside, and smaller protecting stones on the inside — until in December last I agreed to accept a small portion of rocky marl, as a concession to you." The case was first tried before Mr. Justice Kekewich, who held that Mr. Barry had formed and expressed such a decided opinion on the matter that he had not that "open mind" which an arbitrator ought to have; and he accordingly continued the injunction against further proceedings. The company appealed, and the Court of Appeals, by a vote of two out of the three judges sitting, ordered the injunction set aside, on the ground that the letter did not imply that the engineer would not do his best to decide honestly between his own view and that of the contractor, when the matter came formally before him, and that it appeared rather that the contractor was "clutching at a straw," endeavoring, on the ground that the engineer had revealed a view which every one was aware that he entertained, to escape from a clause which he had accepted as a part of his contract, and substitute some different and more agreeable kind of arbitrament before a stranger, or a jury of strangers. One of the judges, dissenting, held that the letter showed that Mr. Barry was not doing his duty in keeping his mind open in regard to the matters in dispute, and that under these circumstances the contractor was entitled to come to the court for relief. The *British Architect* agrees with this judge, and the judge of the inferior court, and thinks that the company ought to have been compelled, under the circumstances, to select another arbitrator.

IN this opinion we are quite unable to coincide. Both the *British Architect*, and the judges whose arguments it commends seem to us to confuse the position of the engineer, as defined by the contract, and accepted by the contractor, with that of an independent arbitrator. If the contractor had merely agreed to accept the engineer as a referee in cases of disputes over points to which the engineer was a stranger, the latter would then have been an arbitrator, and his previous expression of a decided opinion on a point to be submitted to him might properly disqualify him from acting judicially upon it; but the whole tenor of the contract clause shows that the contractor agreed, and intended to agree, not only to accept the engineer as an arbitrator but to accept his view of the meaning of the plans and specifications, or other technical portions of the contract; and, if the engineer thought that the intention of the contract was that the breakwater should be of stone, it is ridiculous to claim that his reiterated and emphatic expression of his opinion relieved the contractor from his agreement to follow that opinion. We suppose that the *British Architect* will hardly say that the engineer ought never to have told the contractor what he considered that the contract required, but should have allowed him to build the whole breakwater of marl before deciding that it should have been of stone; yet this is the logical result of confounding the two functions, of interpreter of the contract, and arbiter in cases of dispute, which, by the agreement of the parties, the engineer was to exercise. Of these two functions, the former is, in all such cases, by far the most important, and nothing could be more unfortunate, both for owners and contractors, than a legal precedent by which the mere statement of the directions of the architect or engineer would rob those directions of their authority, and would substitute for them a trial by jury on every point wherein the opinion of the owner and the contractor as to the meaning of the plans and specifications happened to differ.

THE *Schweizerische Bauzeitung* gives some interesting particulars of the business career of the late Dr. Werner von Siemens. As every one knows, Dr. Siemens began life, as becomes a German youth of distinguished family, by entering the military service, and at twenty-two was an officer in the Imperial Artillery. His passion for scientific research, however, could not find a sufficiently wide field in the study of

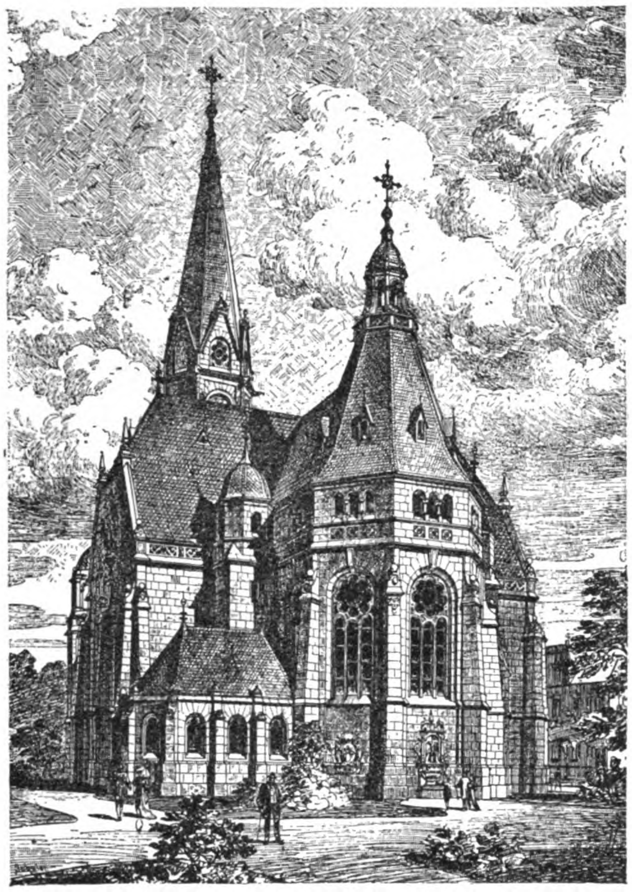
military problems, and he soon resigned, to devote himself particularly to electrical invention, in which he had already won some reputation. In 1847, he decided to place himself in a position to carry his inventions into practice on his own account, and formed a partnership with a mechanical engineer, named Halske. The new firm, under the title of Siemens & Halske, opened a small establishment for telegraph construction. Almost the first contract carried out by the firm was that for telegraph lines from Berlin to Frankfort and Aix-la-Chapelle. Both these lines were laid underground, it being then, as now, thought advisable in Germany, for military reasons, to lay important telegraphs below the surface; and Siemens devised a special insulating covering for the purpose. He had already experimented with insulating coverings for wires, in the construction of a system of submarine torpedoes, to be fired by an electric spark, for the protection of the harbor of Kiel; and he was soon enabled to use the experience so gained in a contract for a submarine telegraph line between Bona and Cagliari. The next year, the firm contracted to build, for the Prussian Government, a complete telegraph system for North Germany; and, in 1853, it was awarded the contract for the Russian system. Halske, although his name was retained, and has become famous by its connection with that of the firm, soon retired from the business, and the great house of Siemens & Halske has for many years only consisted, in reality, of Dr. Werner Siemens and his brothers Charles and William, whom he established as the English representatives of the firm. The three brothers, all of whom soon became noted for their scientific achievements, have carried on the business with a success which is worth noting as a reply to the popular notion that scientific tastes and business capacity are incompatible. The English branch alone has laid six telegraph cables between Europe and America; a branch established at Tiflis carried out the Persian line to Teheran, and the Vienna branch, as well as the parent house at Berlin, has devoted itself particularly, of late years, to building electric railways and electrical machinery. Individually, the members of the firm are reputed to be immensely rich, but it is curious that there is so much to say of their learning and ingenuity that one hears very little of their wealth.

MESSRS. FALDANE AND CARNELLEY have recently made some tests of air in houses and school-rooms in Dundee, Scotland, which appear to differ from any previously made, and have a considerable importance. Samples of air were taken from inhabited houses of various classes, and from school-rooms, some ventilated by artificial means and some by the natural method — with roof ventilators, open windows and so on — and each sample was tested chemically for carbonic acid and organic matter, and microscopically for floating organisms. Of rooms in inhabited houses, it is enough to say that the impurities in the air varied from eleven parts of carbonic acid in ten thousand, with sixty micro-organisms to the litre, in one-room dwellings, with two hundred and twelve cubic feet of air-space on an average to each person, to eight parts carbonic acid and nine micro-organisms in houses with four or more rooms, and an average of about eighteen hundred cubic feet of space per person. In school-rooms, as might have been expected, the results were more unfavorable. In crowded school-rooms, with natural ventilation, having not over one hundred cubic feet of air-space per person, the investigators found twenty-two parts of carbonic acid in ten thousand, and sixteen parts of organic matter, and an average of one hundred and nineteen micro-organisms to the litre. In rooms with from one hundred and fifty to two hundred cubic feet of air-space per person, with natural ventilation, they found an average of nineteen parts carbonic acid, twelve of organic matter, and one hundred and fifty micro-organisms, while, in similar rooms with artificial ventilation — that is, with fresh air forcibly blown in — they found eleven parts of carbonic acid, ten of organic matter and fourteen organisms. This apparent influence of artificial air-supply in diminishing the proportion of infectious germs in the atmosphere is probably to be attributed in part to the fact that school-houses with artificial ventilation are, as a rule, of comparatively recent construction, as compared with the others, for the same experimenters found that of two rooms, similar in all other respects, the one which had been longest built usually showed the largest proportion of bacteria, as if, so to speak, the scarlet-fever and measles germs had made nests and multiplied in the rooms during their longer occupation. It is to be noted that, in rooms with artificial ventilation, the amount of air-space per person seems to have less influence on the number of floating germs than the care with which the room is scrubbed. In a public school-room, where only one hundred and ninety-four cubic feet of space per person was provided, but which was scrupulously clean, only three bacteria to the litre were found; while a rather dirty one, somewhat more crowded, showed thirty, and the average for this class was fourteen.

AN illustration of the difference between the practical knowledge of engineers and architects, and the folly of the attempt, which is often made, to set either to do the other's work, is to be found in a communication recently made to the *Engineering Record*, signed "M. Am. Soc. C. E." The writer of the communication, whose membership in one of the best professional societies in the world gives evidence of his technical knowledge of his own work, wishes to have public attention called to the necessity for legislation, to compel builders to plaster the inside of chimney-flues. He goes on to say that "an unplastered flue is the result of coöperative neglect of inspection by the builder, and laziness by the workman; and proposes that if such a flue should be discovered in a building, the contractor should be subject to fine or imprisonment, unless he produces the workman who built the chimney, in which case the fine or imprisonment should be imposed on the workman. This remedy for "defective flues" seems to its inventor "so effective and simple that there must be some objection to it not seen by the writer, or those who have been consulted, else it would doubtless have been adopted before this"; and he thinks that its adoption would "add greatly to the safety of our habitations and factories."

WE hardly know whether lawyers or architects will be more astonished at this proposition. The idea, when a crime is committed, of laying hold on an innocent man, and imprisoning him until he produces the guilty one, might please a Chinese mandarin, but is quite unsuited to civilized legislation; and, independent of this point, on which we do not feel called upon to enlarge, the assumption that the building of chimney-flues without plastering them inside is the "result of laziness and neglect," or of any other evil traits, on the part of either contractor or workman, is totally unfounded. In point of fact, it takes more labor to build a flue without plastering inside than it does to plaster it, but a very large proportion of architects, builders and fire-engineers think that the unplastered flue is the safer of the two. Every architect knows, either from experience, or from instruction, or both, that, where flues are plastered inside, the interior plastering, in the course of years, is very apt to scale off, and fall, dragging with it a portion, often a large portion, of the mortar in the joints to which it may happen to adhere. If the exterior portion of the mortar in these joints has become loose, as often happens, from various causes, a crevice may be opened, through which sparks may, and often do, escape from the flue, and work mischief. Scores of houses have been set on fire from this very cause, and it is for this reason that the plastering of the inside of chimney-flues was forbidden by law in New York City for many years, and may, for all we know, be still prohibited. Yet the engineer correspondent of the *Record* would have the builders of all the houses erected in New York in compliance with this law, and those of all buildings executed under the direction of architects whose opinion coincides with that of the experts who framed the New York law clapped into jail. Personally, we are inclined to think that the disintegrating action of acid vapors on the joints of unplastered flues rather more than offsets the risk of pulling out the mortar from the joints by the fall of the plastering; and that, if the plastering, or, as it is more properly called, pargeting, is done with mortar containing cement, such as should always be used for the joints, and is put on new, clean brickwork, and brushed down smooth with a wet brush, the flue is somewhat better protected than by simple struck joints, and many fire-engineers take the same view; but it is acknowledged by every one who knows anything about the subject that the question is one of balancing disadvantages, which circumstances of local material or custom may determine either way, and, however "effective and simple" it may seem to an M. Am. Soc. C. E. to solve it by locking up all those who favor one side in the penitentiary, we doubt very much whether the *Record* will second his efforts.

ARCHITECT, OWNER & BUILDER BEFORE THE LAW.[1] — XXVI.



Competitive Design for an Evangelical Church at Heilbronn. From *Architektonische Rundschau.*

THE INTERPRETATION OF CONTRACTS. — ENTIRE AND DIVISIBLE CONTRACTS.

IN some of the discussions contained in the preceding chapters, the distinction between an entire and a divisible contract has been briefly mentioned. In the first, one party agrees to do a certain complete piece of work, for which the other agrees to pay a definite price, no part of which is due until the whole service is performed; while, in the other, the service to be rendered is divisible, either by agreement or by inference, into separate portions, on the completion of each of which a proportionate part of the price agreed to be paid is due. An illustration of an entire contract would be found in an agreement for making a suit of clothes, under which nothing would be due unless the clothes were completely finished; and the purchaser would not be required to receive or pay for a part of the suit, while a divisible contract might be illustrated by a bargain for building ten houses, at five thousand dollars apiece, under which it would generally be held that, if only six were built, the contractor would be entitled to be paid for these.

As a point of abstract legal theory, apart from extraneous considerations, the courts usually hold that a building contract is an entire contract, and must be carried out in full to entitle the builder to any part of the contract price. A man once contracted to build a house for a fixed sum. The builder owed the owner money on some other transactions. When the house was partly done, it happened to become necessary to adjust the accounts between the builder and the owner, and the builder endeavored to set off a part of the value of his work on the house against what he owed the owner. The Supreme Court of Colorado,[2] however, held that, unless the contract for building the house had been entirely performed at the time of the accounting, the builder was entitled to no credit for the work done under it. In this case no time had been specified for the completion of the house, but the court did not consider that this fact entitled the builder to payments on account, or to credit for partial service.

In a Vermont case,[3] a builder, A., agreed to repair a house, and to complete the work by a day named, and the owner agreed to pay a certain sum "when the job is complete." When the builder had partly finished his work, he was sued by another person, and a trustee writ was served on the owner, B. A. subsequently abandoned his work, without fault on the part of B. B. was sued as trustee for A., but the Supreme Court held, in three trials of the case, that B. was not liable for anything as trustee, because the contract was an entire one, and full performance of it by A. was necessary to entitle him to payment, and that A., not having finished what he had agreed to do, was not entitled to *pro rata* compensation for what he had done.

PAYMENT ON ENTIRE CONTRACT NOT DUE UNTIL WORK IS COMPLETED.

Where, therefore, a contract consists of a simple proposition and acceptance, or fails to provide expressly for payments during the progress of the work, on account of the contract price, the contractor is not entitled to claim any such interim payments, and nothing is legally due him from the owner until he has completely fulfilled the contract; and, if he never fulfils it, the owner never owes him anything, provided his failure to complete it is not due to the fault of the owner, or to the interference of the law.

PROVISION FOR INTERIM PAYMENTS DOES NOT AFFECT ENTIRETY OF CONTRACT.

Where, however, the contract expressly provides that payments on account of the contract price shall be made from time to time as the work goes on, it is sometimes questioned whether this provision does not make the contract divisible, so that the contractor, if he has completed the work up to the point at which an instalment of the price is due under the contract, may claim payment of this instalment, even though he abandons the work immediately afterwards.

There would probably be a difference between the courts of different States in their reply to this question in practical cases, but in theory it seems to be generally held that, as the Supreme Court of Ohio[4] puts it, the provision for payment by instalments "is for the convenience of the contractor only," and does not affect the entirety of the contract, so that, strictly, if a contractor fails to complete his contract, the owner is entitled to recover back from him all the instalments that he has paid on account of the contract price, whether they have been paid in accordance with the express stipulations of the agreement, or simply as a favor. Where a builder abandons a contract, it rarely happens, in practice, that he is solvent enough to pay back the instalments that he has received, even if the owner should get judgment for them, and there are very few cases in which the attempt to collect them has been made; but the principle has been repeatedly asserted in connection with other matters, as will be seen later.

It sometimes happens that the question of the divisibility of a contract is more difficult to decide. Sexton,[5] the contractor for the Chicago City-Hall, made his proposal as follows:

"For basement, \$15,400; for first story, \$17,300; for second and third stories, \$35,000; for fourth story, with skylight and roof, \$36,602.69, complete, according to advertisements, and according to the plans and specifications on file in the Department of Public Works of the city of Chicago, for the sum of \$105,302.69." The contract provided that payment should be made on estimates, during the progress of the work, of 85 per cent of the value of the work done and in place at the time of issuing of such estimates, the remaining 15 per cent being reserved until the final completion and acceptance of said work. It appeared that payments were made on estimates by stories. The city, by the Mayor, who was, by the contract, entitled to do so, declared the contract forfeited, on Sexton's failure to put on roofs and skylights as called for by the original plans.

It will be remembered that the Supreme Court[6] decided this point in favor of Sexton, holding that, as he had been shown

[1] Continued from No. 871, page 144.
[2] Walling *vs.* Warren, 2 Colorado 434. *See, also,* Smith *vs.* Brady, 17 N. Y. 133; Brown *vs.* Weber, 38 N. Y. 187.

[3] Kettle *vs.* Harvey, 21 Vt. 301, 24 Vt. 515, 33 Vt. 39. *See, also,* Strauss *vs.* R. R. Co., 7 W. Va. 389.
[4] Lumber Co. *vs.* Purdum, 41 O. S. 373. *See, also,* Grossman *vs.* Bonn, 5 Stud. 43; Sch. Tr. *vs.* Bennett, 3 Dutch. 513; Haslack *vs.* Myers, 2 Dutch. 284.
[5] Chicago *vs.* Sexton, 115 Ill. 230. *See, also,* Brigham *vs.* Hawley, 17 Ill. 38; Holmes *vs.* Stummel, 24 Ill. 370; Evans *vs.* R. R. Co. 26 Ill. 189; Dobbins *vs.* Higgins, 78 Ill. 440; Folliott *vs.* Hunt, 21 Ill. 654.
[6] *See, also,* Butts *vs.* Huntley, 1 Scam. 410.

only tracings of the plans, in which the skylights and other details shown on the original plans did not appear, his contract only required him to execute the works indicated on the tracings shown him. Sexton then claimed that, as the city had declared his contract forfeited without just cause, he was en-entitled to treat the whole contract as having been rescinded, and recover the market value of all the labor and materials which he had furnished by *quantum meruit*, without regard to the contract price which he might have agreed to take for them. The city resisted this claim, maintaining that, even if Sexton was entitled to recover on *quantum meruit*, on account of the rescission of the contract by the city, the contract, as agreed upon by the parties, was separable, each story forming the subject of a separate agreement, so that a rescission of one section of the contract did not disturb the remainder. The court, however, decided against both parties, holding that the contract was not separable, but entire, and that Sexton, under the circumstances, was not entitled to recover the market price for his work and materials under *quantum meruit*, but that their value must be determined by the stipulations of the contract so far as those stipulations could be applied.

DIVISIBILITY OF CONTRACTS ACCORDING TO THEIR STIPULATIONS.

There is another point in which a contract may be divisible. Besides providing for the execution of successive portions of the work, all building contracts divide the description of the work to be done into a great number of separate stipulations regarding the class of materials and the sort of workmanship to be used in every part of the building, and such a contract, even if not separable into portions following each other successively in point of time, might be conceived as separable into a number of independent agreements as to materials and workmanship, the violation of one of which need not necessarily involve the forfeiture of all. If the latter view of the subject can be taken, the contract is divisible; but, if all the stipulations must stand or fall together, it is entire.

It is obvious that the question whether a building contract is an entire one, so that the builder is entitled to no pay unless he carries it out in every particular, or is to a certain extent divisible, so that he can get something for his work, even if it is not completed exactly as the specifications require, is a very important one; and it is one on which the courts have spent a great deal of time, without, however, coming to any very definite conclusion; and it will, perhaps, make the presentation of the law on the subject more clear to refer first to the decisions which take the view most unfavorable to the builder, and then to those which incline to the opposite side, mentioning last some which endeavor, not very successfully, to adopt both views at once.

The leading case[1] on the subject in this country is that known as Smith *vs.* Brady, which was decided in the New York Court of Appeals some years ago. As the decision in this case reversed that of two courts below, and was very fully explained by the judges, it will be of advantage to describe it at considerable length, particularly as it is frequently referred to in building suits.

In this case, a builder, by two agreements, contracted to furnish materials and build three cottages, with out-houses and fences, in accordance with certain plans and specifications, except where otherwise provided, in the best and most workmanlike manner, and to the entire satisfaction of certain architects named in the contract. It was further provided that their decision upon questions of extras and omissions should be final. For this work the defendant agreed to pay the plaintiff $4,900, of which a part was to be paid from time to time as the work progressed, and the balance "when all the work should be completed and certified by the architects to that effect."

The answer to the plaintiff's petition averred that the plaintiff had not performed the covenants on his part; that the work was not done in the most workmanlike manner, or to the satisfaction of the architects; that the materials furnished were of inferior quality; that the plaintiff never procured the certificate of the architects, or either of them; and that, in regard to extras, the defendant had disputed the plaintiff's charges, and had offered to submit them to the architects, as agreed, but the plaintiff had refused to submit them.

The plaintiff, in reply, admitted that he had never procured the certificate of the architects, in consequence of the unreasonableness and frivolous objections of said architects, or one of them, in refusing to give any certificate. He admitted that the work was done, and materials furnished, except for extra work, under the contract.

The case was first tried before a referee, who found that there were omissions and deficiencies in the work and materials, and that the loss to the defendant thereby amounted to $212.57; that the plaintiff had done extra work and furnished materials therefor, to the value of $295; and that the defendant in June (the contract was to be completed May 1) took possession of the three cottages, without objection at the time, and appropriated them to his own use. He reported that, after making the proper allowances and deductions to the parties respectively, the plaintiff was entitled to judgment for $1,934.43, some payments having already been made on the contract.

The defendant appealed from the decision of the referee to the Supreme Court, which approved the referee's judgment; and he then appealed to the Court of Appeals, which reversed it.

It appeared from the evidence that the specifications called for nailing-joists in the frame twelve inches apart from centres, but that they were actually placed sixteen inches from centres; also, that whereas the contract required the third floor beams to be sixteen inches apart, they were actually placed twenty-four inches apart. About 200 joists, in all the buildings, besides the beams, were saved in this way. The plaintiff, to meet this evidence, produced testimony tending to show that the houses were sufficiently strong; that the joists and beams were placed at the distances customary in that neighborhood, and that the defendant was not really injured at all by this violation of the contract. No other variation from the specification is mentioned in the report, and these would probably account for the referee's deduction of $212.57. No explanation of the omissions was given, nor was any evidence offered to show that they were not intentional.

The Court of Appeals, in reviewing the case, set itself this question. "In a building contract, where performance is to "precede payment, and becomes a condition thereof, can the "builder, having failed to perform on his part, recover for his "work or materials, making the other party a compensatory "allowance for the wrong done him, it being also a further "condition of the question that the employer chooses to occupy, "and enjoy the erection, rather than to remove or require the "builder to remove it from his premises?" The Court cited decisions both in the negative and the affirmative. In Ellis *vs.* Hamlin,[2] tried before Chief Justice Mansfield, the plaintiff, a builder, had omitted to put into the building certain joists and other materials. Failing to prove performance of the contract, he resorted to a general count for work, labor and materials, claiming that the defendant, having the benefit of the houses, was bound at least to pay for them according to their value. "But Chief Justice Mansfield repudiated that "doctrine. He said, 'The defendant agreed to have a build-"'ing of such and such dimensions. Is he to have his ground "'covered with buildings of no use, which he would be glad to "'see removed; and is he to be forced to pay for them besides? "'To be sure, it is hard that a man should build houses, and "'not be paid for them; but the difficulty is to know where "'to draw the line; for, if the defendant is obliged to pay for "'one deviation from his contract, he may equally be obliged "'to pay for anything, how far soever distant from what the "'contract stipulated for'; and the plaintiff was non-suited."

The Court of Appeals went on to say that "the supposed "liability of a person who enters and occupies a building "erected on his ground to pay the builder, although the latter "failed in performing his contract, has always been referred to "the general doctrine that benefits received and retained under "a contract must be paid for without regard to the conditions "of the contract itself. I am confident that no case can be "found in which the building-contractor's right to recover has "been maintained on the ground that the owner, by the mere "possession and occupancy of the building, has waived the "condition of performance." "In this State [New York] "the sanctity of contracts, in this respect, at least, has been "strictly maintained, and no encouragement has ever been given "to that loose and dangerous doctrine which allows a person

[1] Smith *vs.* Brady, 17 N. Y. 173.

[2] Ellis *vs.* Hamlin, 3 Taunt. 52. McMillan *vs.* Vanderlip, 12 John. 665. Thorpe *vs.* White, 13 John. 53. Jennings *vs.* Camp, 13 John. 94. Champlin *vs.* Rowley, 13 Wend. 258. S. C. in Error, 18 Wend. 187. Paige *vs.* Ott, 5 Denio. 406. Pike *vs.* Butler, 4 Comst. 360. Pullman *vs.* Corning, 5 Seld. 93.

"to violate his most solemn engagements, and then to draw "the injured party into a controversy concerning the amount "and value of the benefits received. . . . If the owner, having "regard to strength and durability, has contracted for walls of "specific materials, to be laid in a particular manner, the "builder has no right to substitute his own judgment for that "of others. Having departed from the agreement, if perform-"ance has been waived by the other party, the law will not "allow him to allege that he has made as good a building as "the one he had engaged to erect. He can demand payment "only upon and according to the terms of his contract; and if "the conditions on which payment is due have not been per-"formed, then the right to demand it does not exist."

"Cases of this kind," the Court continued, "must not be "confounded with others having perhaps a slight resemblance, "but no real analogy. . . . If A. should agree to make and "deliver to B. a carriage of a particular kind, and should "make a different one, B. may elect whether he will take it or "not. Until he so elects, he has no property in the fabric. "If he voluntarily accepts it, he either waives the objections "which he might make to it, and is liable to pay for it under "the contract, or he must pay for it on its own merits, as if "there had been no previous contract. But where the owner "must, in the nature of things, receive the benefit of the par-"tial performance of the contract, he is, if the contract so pro-"vides, under no obligation to pay anything unless the contract "is completed. Thus, if one engages to labor for a year, al-"though the employer receives the benefit of each day's labor, "he is not bound to pay anything if the laborer without just "cause abandons his service before the year has expired. "Also, if one contracts to plough twenty acres of land, and "abandons the work after ploughing nineteen, he can recover "nothing, although the owner plants and cultivates the nineteen "acres, for the reason that the owner cannot reasonably do other-"wise. . . . He is not obliged to abandon his field in order to "be enabled to insist on the condition of the contract." So with building contracts. "The owner of the soil is always in "possession. He is not in a situation to elect whether he will "or not accept the benefit of an imperfect performance. He "cannot reasonably be required to tear down the building in "order to stand upon the contract, and there is no rule of law "against his using it without prejudice to his rights. More-"over, as being annexed to the soil, the building is his prop-"erty, and the builder would have no right to remove the brick, "or stone, or lumber, after annexation, even if the employer "should unjustifiably refuse to allow him to proceed with the "work."

"It is true that contracts embrace a variety of particulars, "and that slight omissions and inadvertencies may sometimes "very innocently occur. These should be indulgently regarded, "and they will be so regarded by courts and juries. But there "can be no injustice in imputing to the builder a knowledge "of what his contract requires, nor in holding him to strict "performance. . . . If he fails to perform, when the require-"ment is plain, and when he can perform if he will, he has no "right to call upon the courts to make a new contract for him; "nor ought he to complain if the law leaves him without "remedy."

The Court, therefore, held, that the evidence to show that the houses, as built, were sufficiently strong, and the timbers placed at distances customary in that neighborhood, was improperly admitted, and that the plaintiff was not entitled to recover for his work and materials, even upon making to the defendant an allowance for the breaches of the contract, to be adjusted according to some principle of equity.

Another somewhat noted New York case[1] extends and explains the doctrine held in Smith *vs.* Brady. One Gugerty, a mason, agreed in writing to provide materials, and execute certain work "in a good, substantial and workmanlike manner, in strict conformity with plans and specifications prepared by E. J. Webb, architect," so that the house might be completed, if the carpenter should be guilty of no default, on or before a certain day. In consideration of this, the owner, Smith, agreed to pay $5,900, by instalments, each payment to be made when the architect should certify in writing that the work had been performed which entitled Gugerty to such payment. The owner "reserved the right to alter, add or omit either workmanship or materials," and to "pay and allow a fair valued price for any addition or alteration so ordered that may add to such contractor's expense"; and he also "made it a right to claim a fair valuation for either workmanship or materials which, by a written order, delivered to the contractor by a third person, he, the owner, should think proper to have omitted." But it was agreed that "no such deviation from the original plans should impair the contract between the said parties, or destroy its binding influence or validity."

The owner ordered verbally a considerable amount of extra work, and also verbally directed omissions to be made. The house was not finished until long after the contract time. The architect gave his final certificate as follows: "I pronounce the houses finished, and if not literally so in every punctilio, they are done in that manner that, was I the owner, I would accept them for myself."

Smith kept back a part of the price for the contract and extra work, on the ground of delay, and said also that no written order had been given for the extras, and that the architect's certificate did not set forth that the work had been performed according to the plans and specifications.

Gugerty sued for his money, and recovered it. In its decision, the Court said, "The parties to building contracts appar-"ently differ most widely in reference to their obligations. "The builder seems to suppose that while he adheres gener-"ally to the plan which is prescribed for him, he is at liberty "to disregard minute and unimportant particulars; while the "owner imagines that a departure from such plan in any re-"spect, although it may be the effect of accident, and of no "possible injury to him, exonerates him from the obligation to "make any payment which is in terms made dependent upon "the full performance of the contract. Both are wrong. . . . "A substantial compliance, without any intentional variation, "should in all cases be considered as a full performance of a "condition, whether precedent or consequent."

With regard to delay, the Court said: "Taking the old work "and the new together, Gugerty never agreed to perform the "whole within the time specified in the contract. An exten-"sion of the work called for, and justified, an extension of "time. But if there had been no additional labor, the pro-"traction of the time, if assented to by Smith, would not im-"pair Gugerty's claim. This assent need not be in writing," and here Smith, by making no complaint of the delay at the time, tacitly assented to it.

As to the absence of written orders for changes, although there was no positive evidence that Smith ever verbally ordered all of those made, he certainly saw them made, without objection, and ordered at least many of them himself. On one occasion, where he had given verbal orders for extra work, and Gugerty objected that the contract required a written order, and said that he had done enough without a written agreement, and should do no more, Smith called a witness, and in his presence, and in that of the architect, said, "Whatever extra work you do for me, I will pay you for it." And the architect said, "Mr. Gugerty, that is as good as a written order to you, and I will see it right to you." The Court mentioned this evidence, and observed: "Moreover, Smith claims deductions "for omissions, without proof of written orders, and the infer-"ence is clear that the parties mutually waived the provision "requiring a written memorandum for extra or omitted work."

As to the insufficiency of the architect's certificate, the Court held that, as Smith had by his own acts, or with his consent, made it impossible for the architect to certify that the work was done according to the specifications, he could not object that the certificate was insufficient.

WILFUL OR CARELESS DEPARTURES FROM CONTRACTS.

There are indications that the contract in this case was not drawn in the ordinary way in regard to certain points, such, for example, as the provision for extension of time in case of extra work; so that some parts of the decision would be modified, if applied to the forms of agreement which architects now generally use. However, the principles laid down by the Court are valuable, and are well summed up in the report, as follows: "Parties to building contracts should be exact in the fulfilment of their agreements, even to the smallest particulars; and if they wilfully or carelessly depart from any one of them, they should incur the penalty, however severe it may be. But if a party, while acting in good faith, and with a determination to do all that he has contracted to do, unintentionally, and without any negligence, happens in some trifling matter to vary or depart from the terms of the contract, the law is not so severe

[1] Smith *vs.* Gugerty, 4 Barb. 614.

and exacting as to deprive him of all compensation. It ever regards the substantial rights of the parties, but overlooks trivial and unimportant matters.

"Where, after the making of a building contract, additions to the original specification are made, at the request of the owner, and requiring additional time, the time limited for the completion of the contract will be deemed to have been extended, by mutual agreement of the parties, if an extension is necessary for the protection of the contractor."

As before observed, this doctrine would not apply to a case in which the contract itself specified in what way, and under what conditions, the time for completion should be extended, or to one which expressly provided that it should not be extended under any circumstances. In such cases, the parties having themselves agreed upon the rule by which they will be governed, the courts will not interfere with their agreement.

WHAT DEVIATIONS ARE UNINTENTIONAL AND INADVERTENT.

Just how much variation from the plans and specifications would, under this stricter theory of the entirety of a building contract, be regarded as "unintentional or inadvertent," so that the court would still consider that the contract had been "substantially" complied with, is a rather indeterminate point, although an important one; and perhaps nothing better can be done to illustrate it than to collect a number of actual decisions, the account of which, if tedious to the general reader, will be all the more valuable to persons in need of suggestions on the subject for being somewhat minute.

A block of stores was built under contract[1] in New York. The city gave the contractors the wrong grades for the sidewalk, so that the stores were set a step higher than they should have been. The contractors, during the progress of the work, pointed out the mistake, and explained to the architect, and to a representative of the owner, the cause of it. No complaint or objection was then made by either. When the buildings were completed, the architect gave his certificate for the final instalment of the contract price, and a part of the instalment was paid. Payment of the balance was, however, refused, on account of the mistake in setting the buildings. The suit of the contractors for their money was carried to the Supreme Court, which decided in their favor. The Court said, "Where "there has been no wilful departure from the terms of a build- "ing contract, nor any omission in essential parts, and the "laborer has honestly and faithfully performed the contract, in "all its material and essential features, he will not be held to "have forfeited his right to remuneration by reason of mere "technical, inadvertent and unimportant omissions or defects. "A substantial compliance with the contract is all that is re- "quired to entitle the builder to his reward."

Where a contract[2] had been made for altering a house, the price for the work, as fixed by the contract, being $550, with board for the contractor and his workmen, and fodder for his horse, it appeared, after the work was finished, that the roof and chimneys were not well supported; that the folding-doors were not well hung, and their casings were not well fitted; that the tarred paper and clapboards were in some cases not well put on, and that one door and casing was set so that the door would not shut.. The referee appointed by the Court found that, notwithstanding these omissions, for which he thought that $100 should be deducted from the contract price, the contract had been substantially performed.

The owner, probably thinking that a contract could hardly be said to have been "substantially performed" by a contractor who had left out about one-sixth of what he had agreed to do, appealed, and this insignificant controversy was carried to the highest court in the State of New York, which sustained the decision of the referee.

(To be continued.)

INSURANCE COMPANIES AND THE MAINTENANCE OF FIRE-DEPARTMENTS.—How much do the great insurance companies of New York contribute toward the maintenance of the Fire-department of New York? In London the fire-insurance companies are taxed to the extent of about $200 for every $5,000,000 insured. This gives the Metropolitan Fire-department an income amounting to several hundreds of thousands of dollars. The London County Council is now discussing a proposal for increasing this contribution by the fire-insurance companies, on the ground that the British metropolis has increased during the past few years both in size and wealth.—*N. Y. Tribune.*

[1] Sinclair *vs.* Tallmadge, 35 Barb. 602.
[2] Woodward *vs.* Fuller, 80 N. Y. 312.

CONSTRUCTION.[3]—XVIII.

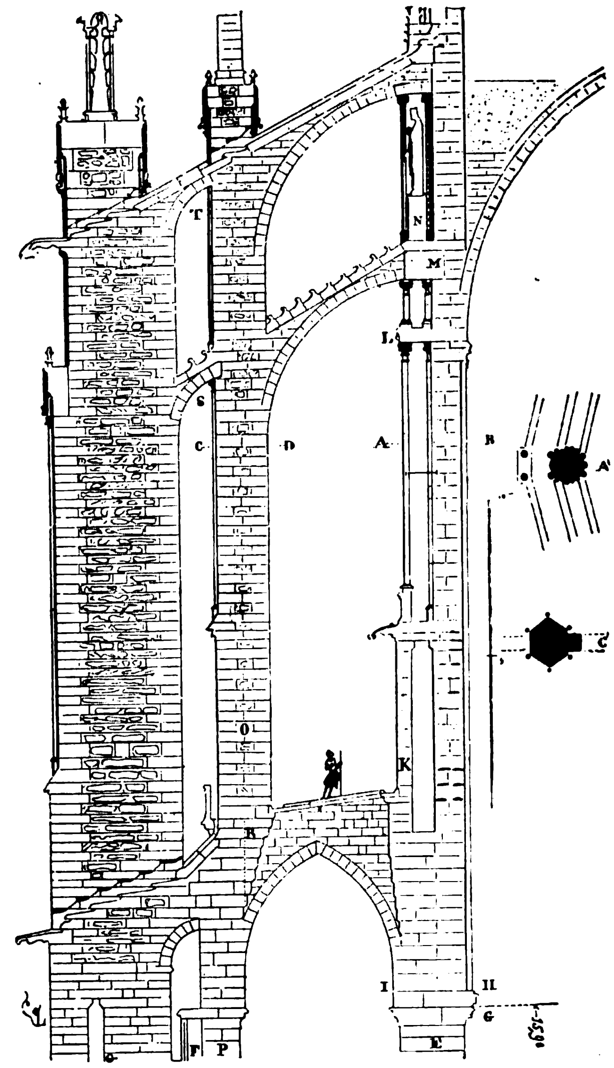


Fig. 101. Flying-Buttresses at Beauvais.

WE have given in the article "*Arc-Boutant*" (Fig. 61) the general view of the system adopted for the building of the flying-buttresses of the apse of the Cathedral of Beauvais. We must return to the details of this construction, and it will be seen how the builder of this choir tried to surpass the work of his fellow-architects at Amiens. Yet these two apses were built at the same time, that of Beauvais perhaps being later by some years. We suppose, just as we have done for a flying-buttress in the choir of Notre Dame of Amiens, a section made through the axis of the piers of the apse at Beauvais. (Fig. 101.) It is interesting to compare these two sections; we, therefore, give them on the same scale. At Amiens, the piers of the chancel are 14 metres high from the pavement of the aisle to the abacus of the capitals supporting the vaults of the aisles. At Beauvais, these same piers are 15.90 metres. But at Amiens, the absidal chapels are as high as the aisle, while at Beauvais they are much lower, and between the platforms that cover them and the vaults of this aisle there is a gallery, a triforium *F*. At Amiens it is the intermediate pier which has the passive rigid resistance, thanks to its mass and to the manner of building the lower piers, as we have just shown; the second pier is only an accessory, a surety, an additional though necessary precaution.

At Beauvais the master-builder tried to give this intermediate pier an active resistance, and to bring to the second pier, the exterior one, the passive resistance which he must always find somewhere. He expected thus to be able to secure more lightness in the general effect of his structure, more height and more solidity. As we have already said, the piers *E* of the chancel have more space, are thicker than those at Amiens, in the direction of the thrusts.

The groups of pillars carrying the pointed and wall arches of the high vaults are set in corbel-form upon the lower capital *G*. The impost *H I*, is hence greater, and the pier *K* of the large triforium rests vertically upon the lower pier.

Upon this pier *K* of the triforium there is no longer one column, as at Amiens, to receive the end of the flying-buttress, but two smaller columns set against the cleavage, as seen by the horizontal section *A'* made through *A B*.

These two columns sustain the lintel *L*, which is a course acting

[3] From the "*Dictionnaire raisonné de l'Architecture Française,*" by M. Viollet-le-Duc, Government Architect, Inspector-General of Diocesan Edifices, translated by George Martin Huss, Architect. Continued from No. 886, page 182.

as ceiling. The other two columns are set between this lintel-course and the top of the flying-buttress, which rests against an enormous block *M* of stone, weighted by a course, as cornice, and a pedestal *N* supporting a colossal statue.

Another pair of pillars is placed in front of this statue, between the first and the second flying-buttresses. These latter pillars support, not the top of the flying-buttress, but a pinnacle whose form and structure we shall at once point out. The whole system resembles that which we have seen at Amiens. Yet we notice that the whole method of double building exerts a vertical pressure upon the lower pier, whose interior is built in courses, and its exterior in large, rigid pieces, set against the cleavage, to give firmness to the structure at once so slender and so tall: we notice, too, that the strong lintel *L*, the block *M*, and its burden *N* tend evidently to add considerable weight to the top of the support below, in order to keep it vertical and make good its function of stanchion.[1]

Hence the inner pier is made as rigid as possible, for it is now necessary to resist the thrust of the vault, acting from an enormous height.

The architect felt unable to get along with a single flying-buttress, as at Amiens, even were it surmounted by a rigid open-work; he was right, for at Amiens, in the parallel parts of the choir which received three vault-groins instead of one, these flying-buttresses with open-work were displaced by the pressure of the vaults, and in the fifteenth century it was necessary to build new flying-buttresses under those of the thirteenth. But the master-builder of Beauvais here evinced an unparalleled hardihood, and at the same time a rare sagacity. It is seen that the intermediate pier *O* does not rest squarely upon the pier *P*, the summit of the chapel, as in the Cathedral of Amiens, but that its axis is in the same vertical with the inner facings of that pier *P*.

Let us say at once that this pier *O*, whose horizontal section through *C D*, we give at *C'*, has greater weight in its side *C*, than on the side *D*. Its centre of gravity is then inside of the dotted line *R*, or, in other words, above the pier *P*.

Still the pier is thus in equilibrium, and tends to incline towards the interior of the church rather than toward the large outer buttress; it succeeds, then, by its position; first, in drawing off the thrust of the two flying-buttresses, secondly, in adding to the resistance opposed by these flying-buttresses a tendency to incline toward the choir.

The vertical pier *O* thus does the duty of an oblique prop. If this active resistance does not suffice (and it cannot suffice), the pier *O* is in its turn sustained in its function by the two secondary flying-buttresses *S* and *T*, and by the large passive buttress. But, some one may object, why this intermediate pier? Why do not the large flying-buttresses rest simply upon the large passive buttress without?

It is because the large outer pier could not buttress the thrust of flying-buttresses of so great radius, without being doubly augmented, and because, thanks to the intermediate pier *O*, it has only to buttress a pressure that is diffused and almost annulled.

To explain clearly the function of the pier *O*, let us suppose that we have to put props under the choir of Beauvais, and let us suppose that we have only the large buttress to place our props upon.

If (Fig. 101*b*,) we set our props as indicated in *A*, we shall surely overturn the pier *C*; but if against the pier *C* we place, according to the drawing *B*, an intermediate prop *D E*, slightly inclined toward the choir but kept in a vertical plane passing through

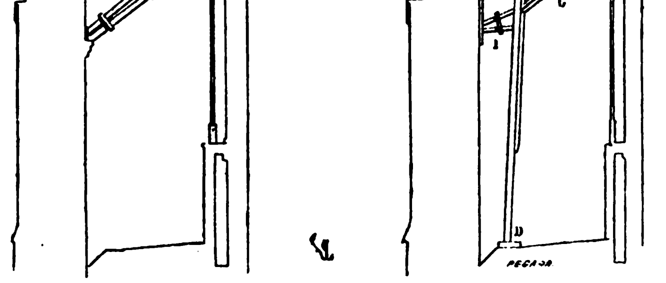


Fig. 101*b*.

[1] In the fourteenth century the columns placed upon the triforium had become broken, and there was placed instead of them a solid pier (see Fig. 61, article "*Arc-Boutant*"); but it is still possible to-day to recognize their position and approximately their diameter.

the axis of the piers of the radius of the chancel, and if from that prop we extend two supports *F* and *G* against the vault, and then two others at *H I*, we shall no longer need to fear the effect of the thrusts of the vaults *V* upon the great buttress *C*, for the intermediate prop *D E* will draw off a large part of the thrust by the two supports *F G*, and will transmit it to its base *D*. This is the whole problem given and solved by the architect of the choir at Beauvais. Unhappily, the execution is defective. Still, it is certain that this immense edifice would have kept perfect stability if the architect had made the two pillars above the triforium stronger and more resistant, if he could have made them of cast-iron, for instance. The disorders which have occurred in the structure have all come from this; these columns, too slender, have given way, for they could not resist the weight brought upon them when the inner piers began to settle in consequence of the drying of the mortar. In the disorder the lintels *L* (Fig. 101) were broken, the large blocks *M*, in swaying, rested too heavily upon the top of the first flying-buttress; this latter was thrust out of shape, and, the vault following the movement, the pressure upon these flying-buttresses was such that they nearly all were forced outward and their action annulled, while, in consequence, the upper flying-buttresses were loosened somewhat, since the vault no longer pressed against them. The equilibrium was broken; and considerable labor was needed to avoid the total ruin of the edifice.

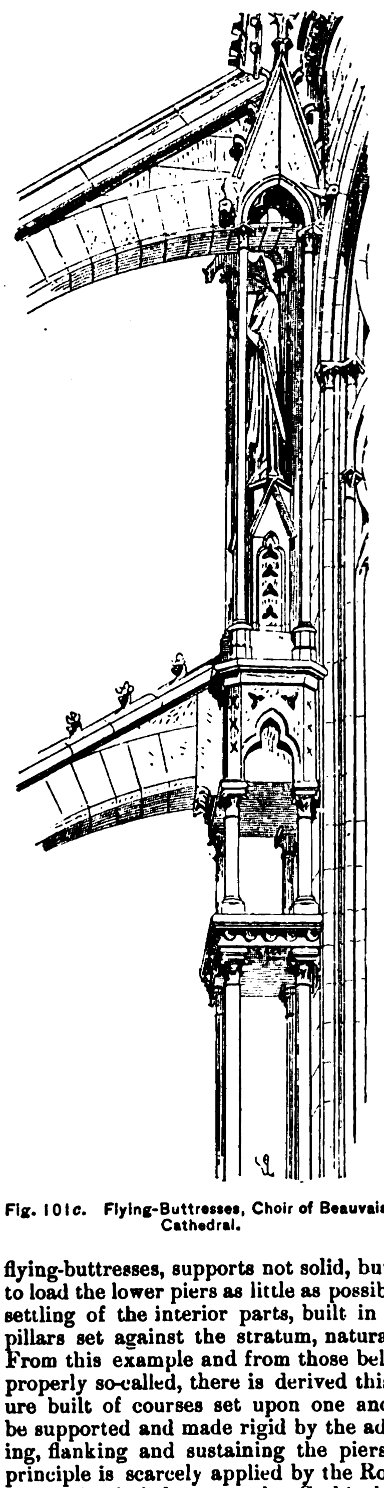


Fig. 101*c*. Flying-Buttresses, Choir of Beauvais Cathedral.

Figure 101*c* gives in perspective the summit of the piers receiving the tops of the flying-buttresses, and shows us clearly that the intention of the master-builder was to obtain at the height of the piers of the choir of the Cathedral of Beauvais, and under the flying-buttresses, supports not solid, but perfectly rigid, in order, first to load the lower piers as little as possible; and secondly, to make the settling of the interior parts, built in courses, and stiffened by the pillars set against the stratum, naturally carry the weights inward. From this example and from those belonging to Gothic construction properly so-called, there is derived this principle: that every structure built of courses set upon one another in large quantities must be supported and made rigid by the addition of monoliths surrounding, flanking and sustaining the piers composed of courses. This principle is scarcely applied by the Romans, who had no need to resort to it; it belongs to the Gothic builders. From this principle they make one of the most ordinary *motifs* for the decoration of buildings and, in fact, it lends itself to the most brilliant and daring arrangements.

(To be continued.)

A NEW ENAMEL FOR IRON.— It is stated that M. Bertrand, who some time since invented a novel magnetic oxidizing process for the prevention of rust on cast-iron, a method now in successful application in Paris and elsewhere, has lately devised a new system of enamelling. Its satisfactory character is said to have become established to such an extent that the Société du Val d'Osne, well known as the principal ornamental casting manufacturing concern in France, has not only adopted the method, but has secured a monopoly of the market for art castings thus produced. The imitation of the most variegated marbles by this means is represented as being so perfect that the illusion is absolute. Further, M. Bertrand is able to enamel cast-iron, wrought-iron, and steel with equal facility, accumulating shade upon shade, delicately blending these so as to produce the highest artistic effect.— *New York Sun.*

COMPARATIVE MUNICIPAL BUILDING LAWS.—XIX.

[*Note:*—In these tables bracketed letters invariably refer to preceding passages in the same column.]

Fire-Stops and Timbers near Flues.

(See "*Fireproof Construction.*")

Boston:—*a. Every second-class building* (except as hereinafter provided) shall have sufficient fire-stop at each floor, covering whole floor of each story, through stud partitions, and extending to masonry walls.
b. Every air-duct (except those expressly sanctioned by this act) shall be effectually stopped at each story.
c. Such fire-stop shall consist of solid, air-tight, cohesive layer, at least 1″ thick, of tile, brick or like fire-made material, plaster, cement, cinder or ashes, or of a combination of same, or of equally non-inflammable, non-heat-conducting materials, laid between upper and under floors, or occupying all space between timbers under floor.
d. Second-class buildings 45′ or more high, used for storage or for sale of merchandise, shall have a tight-splined or tongued and grooved under floor of at least 2″ plank, with upper floor 1″ thick, matched and breaking joints. [*c* does not apply to such buildings.]
e. The foot of each partition and of each tier of studding or furring shall be filled solid between uprights to full width thereof, and for 6″ above floor, with incombustible materials as provided under *c*.
f. The spaces between such parts of floor joists as rest on partition heads shall be filled with materials as specified under *c*.
g. Spaces between stair strings and landing joists, unless unceiled, shall be so stopped with materials as specified under *c* at least at three places on each flight of stairs, so as to be air-tight.
No wood furring shall be used against or around any chimney but plastering directly on masonry or metal lathing. No floor timber shall be within 2″ of chimney. No studding or furring within 1″ of any chimney.

Baltimore:—*h.* No woodwork shall be placed against any flue used to convey heated air, unless plastered behind such woodwork with incombustible or non-conducting material. No timber shall be placed within 2″ of outside of any flue.

Brooklyn:—*i.* No timber resting on wall shall be placed within 8″ of inside of any flue, nor shall any header be placed within 6″ of inside of any flue, and the space between wall and header, if less than 2″, shall be filled with plaster-of-Paris. No woodwork shall be placed within 5″ of any flue.

Charleston:—

Chicago:—*j. Buildings with area exceeding 10,000 square feet, and over 40′ high, and buildings with areas exceeding 6,000 square feet, and over 56′ high*, shall have floors deafened with mortar, or its equivalent, at least 1″ thick. *Hotels and tenement-houses*, scantling partitions to be lathed and plastered shall be filled with brickwork 8″ high in best manner.
k. Buildings for residence and business shall have brick project not less than 1½″ inside face of wall between the joists of each floor and ceiling.
l. Floor beams, joists and headers shall be kept at least 2″ clear of wall enclosing fire-flue or chimney-breast, the space between framing and such flue filled solid with gauged mortar; to be a heavy coat of plastering put on walls of such flues before woodwork is placed against it.

Cincinnati:—*m.* Joists carried on girders shall have cut-off partition or row of solid bridging not less than 1½″, set in and solidly nailed over girder to prevent passage of fire or smoke. *Wooden buildings in blocks of two or more* shall have party-walls of incombustible material extending to under side of roof boards.
n. No timber or woodwork shall be placed within 6″ of any smoke-flue, or within 2″ of face of wall enclosing a flue, unless face of wall is plastered.

Cleveland:—(*m*); (*n*).

Denver:—*In brick buildings over two stories high other than dwellings:*
o. The inside of all furred brick walls shall have fire-belt composed of some fireproof material at least 6″ wide, thoroughly set up between furrings at top and bottom of each story, and
p. The whole area of each floor covered with asbestos paper or other incombustible material satisfactory to Inspector, placed upon under or rough flooring, and
q. On each story in which stud walls or partitions rest on wall or partition immediately under such stud construction, the space between floor joists and between studs from under side of joists shall be filled with incombustible material, solid and flush with face of plaster on both sides, or, if such studs rest on solid timber for full length thereof, then the same height of such filling shall be placed on top of joist. Or
s. Where there is no wall beneath such stud construction, a strip of tin or galvanized iron at least 1″ wider than said partition, continuous under partition, or wall may be substituted for filling, and
t. Spaces between stair strings and landing joists of all wood staircases, unless such strings and joists are not enclosed, shall be closed at intervals of 3′ by substantial stops of incombustible materials.
u. In brick buildings, floor timbers shall be placed at least 2″ from outside of chimney flue, and space between timber and wall closed by proper fire-stop of incombustible material.

Detroit:—

District of Columbia:—No timbers or other wood shall be built into any flue or fireplace, nor placed less than 2″ from outside of brickwork of any flue or fireplace. No woodwork shall be placed against any flue until well plastered externally with proper material.

Kansas City:—*Buildings exceeding 50′, and not exceeding 75′ in height* (*not including chimneys and fire-walls*), *except churches and grain elevators* (*o*), (*p*), or with plaster 1″ thick (*q*). Filling to extend 6″ above top of joists (*r*).
v. Or, *when there is no wall or partition* beneath, a strip of tin or galvanized iron at least 2″ wider than studs, continuous under footing of wall, or partition may be substituted for filling.
(*t*) Or such spaces plugged solid with incombustible material.
w. Forms of construction tending to form air-spaces from one story to another, such as about pipes, ventilating-shafts and chimney-breasts furred out, shall have fire and smoke stop of incombustible material at each floor, as approved by Superintendent. (*u*).

Louisville:—*x. In hotels and tenement-houses*, scantling partitions to be lathed and plastered shall be filled with brickwork 8″ high between scantlings.

Memphis:—*y.* In furred walls, the course of brick above the under side and below top of each tier of floor beams shall project the thickness of furring.
z. In brick and frame buildings, headers and trimmers and all timbers resting near flue must be lined with tin or sheet-iron on side next flue and 8″ beyond.
aa. Iron posts in front of party-walls shall be filled solid with masonry and made smoke-tight between post and wall.
bb. Wooden beams shall be trimmed away from all flues; trimmer 12″ from inside of flue in a straight way, and 8″ in a chimney-breast, and header 4″ from outside face of flue. (See "*Recesses.*")

Milwaukee:—Floor timbers must be kept 2″ clear of wall enclosing fire-flue or chimney-breast, and heavy coat of plaster put on wall of such flue before woodwork is placed against it. (*k*).

Minneapolis:—Floor timbers shall be kept at least 1½″ clear of wall enclosing fire-flue or chimney-breast, the space between framing and wall filled solid with gauged mortar; to be heavy coat of plastering on wall before woodwork is placed against it. (*x*).
Residences and business buildings shall have brick project not less than 2″ inside face of wall between joists of each floor and ceiling joists, the full height of joists.
Buildings containing church, school or assembly room, or any stone or brick building in which wooden furring and partitions are used, shall have at bottom of such furring or partition timbers in each story, cut-offs of slow-burning material, put in in such manner as approved by Inspector.
cc. Factories, mills, buildings where more than 25 operatives are employed, hotels, boarding, lodging, apartment and tenement houses, business buildings less than 50′ high not hereafter specially mentioned, shall have partitions enclosing or adjacent to stairs of incombustible material.

Nashville:—Floor timbers shall be kept at least 1½″ clear of any wall enclosing any fire, hot-air flue or chimney-breast. Space between framing and such flues filled solid with gauged mortar. (See "*Flues.*")
Brick or frame building: No timber shall be placed within 8″ of inside of flue used for smoke or hot air.

Newark:—No woodwork shall be placed within 8″ of inside of flue.
No beam or header within 2″ of outside of chimney or flue.

New Orleans:—No timber resting on walls shall be placed nearer than 8″ to any flue.
No chimney shall be built against timber.

New York:—(*y*). Recesses around pipes shall be filled with solid masonry for the space of 1′ on the top and bottom of each story. (*aa*); (*bb*).

Omaha:—Floor timbers shall be kept at least 2″ from brickwork of chimney or ventilating flue, and space between timbers and chimney or flue closed with gauged mortar.
All brick buildings, (*o*); the whole area of every floor from wall to wall deafened with lime mortar at least 1″ thick, or a two-ply covering of asbestos paper properly lapped; or two thicknesses of heavy building paper placed upon the under or rough flooring. In each story in which stud walls or partitions are constructed and rest on walls or partitions said stud construction shall have space between floor joists immediately under such construction, and between studs from under sides of joists to a line 6″ above said joists, filled solid and flush with face of plaster on both sides with incombustible material; and if such studs or partitions rest on solid timbers whole length thereof, such filling as above shall be used; (*t*) or shall be plugged solid with gauged mortar.
In hotels and tenement-houses, scantling partitions shall be lathed and plastered on both sides, and filled with brickwork 8″ high in best manner.
Brick buildings, (*w*).

Philadelphia:—*dd.* No timber shall be built into any chimney or flue.
ee. No timber shall be placed within 2″ of outside of flue.

Pittsburgh:—(*dd*).

Providence:—(*cc*) or of at least 2″ by 3″ studding, plastered on both sides and protected as follows: The space from top of lathing or head of partition below to line 3″ above top of baseboard, or, if no baseboard, 6″ above top of floor; also space adjoining strings of stairs from under side of strings to line 3″ above baseboard, or, if no baseboard, to 6″ above rake of nosings, shall be filled solid with brick or stone set in mortar, concrete grouting, tile or other incombustible filling. If stairs are wainscotted, similar filling 3″ above and below top thereof. In such *buildings three stories high, warehouses, storehouses, business buildings over 50′ high*, and all business buildings in first district, said partitions shall be constructed as above and filled solid whole height, or, on side adjoining stairway, plastered on iron laths or covered with other incombustible material. *All above buildings*, spaces between floor joists in each story at stair landing, and space above floors immediately below stairs; if ceiled or lathed with wood, shall be filled with mortar or concrete from top or laths or ceiling to ½″ above bottom of joists, and connection between such spaces and other parts of floor so cut off.
Buildings within first and second building districts more than one story high (*except dwellings occupied by not more than two families*) in which walls are furred off or (*q*) filled 6″ above top of joist (*s*). Above filling shall be put in at each floor of building, and between tops of wall, plates and partition heads and roof boards.

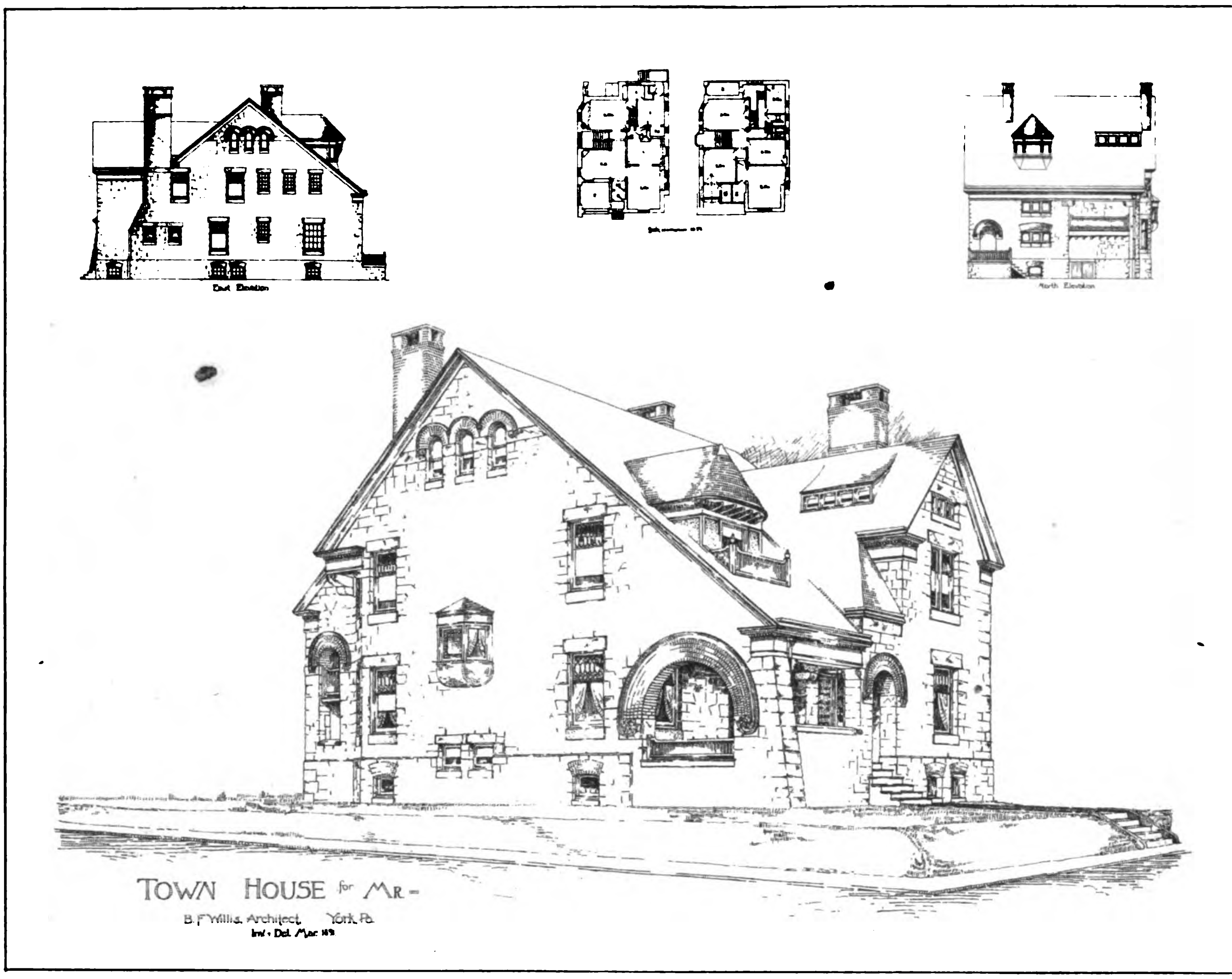
St. Louis:—(*l*) applies also to rafters, etc.

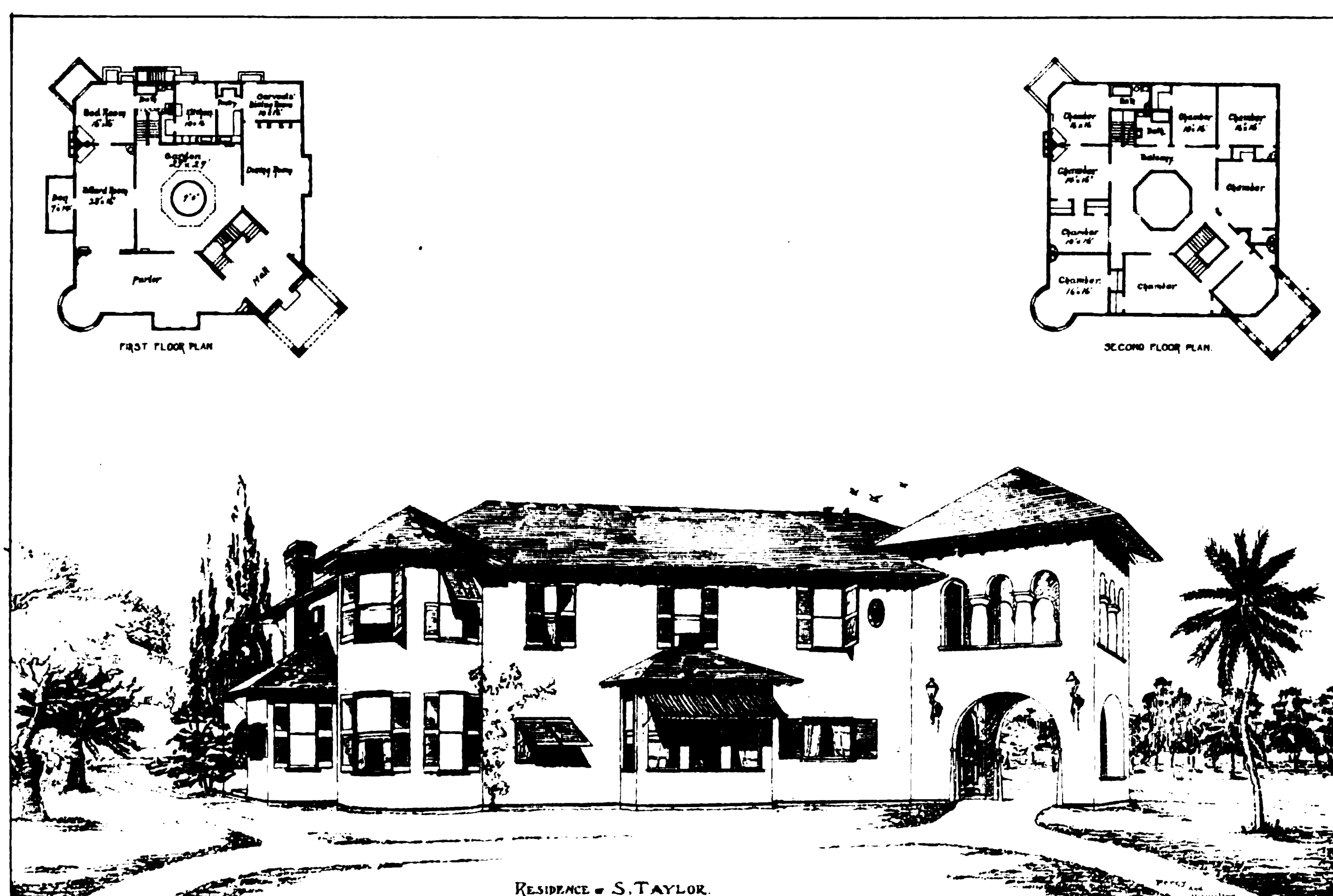
San Francisco:—*All buildings.* No timbers shall be placed within 6″ of flue. No woodwork shall be placed within 8″ of flue. No timber shall be placed under fireplace or hearthstone. No woodwork shall be placed against any smoke-flue unless there is at least 8″ of solid brickwork between it and flue.
In brick walls, recess around pipes shall be filled solid for space of 2′ on top and bottom of each story, to prevent passage of smoke or fire.
When chimney-breasts are furred out and flues are less width than chimney-breast, the space between furring and flue shall be so bridged at each half-story and at ceiling line as to prevent passage of fire and smoke.
Partitions formed of more than one row of studding, or are cross-furred, the bridging shall finish flush with the face of the studs or furring at each side, so as effectually to prevent passage of fire or smoke.
Brickwork used for deafening between partitions of framework shall be commenced on proper footings 12″ below surface of ground on which building rests; shall not be less than 4″ thick; shall be solidly laid in good lime mortar, joints smoothly struck on both sides; proper cross-ties, not to exceed 1½″ by width of studs, placed at each half-story in height, securely spiked to studs which shall not be more than 2′ on centres. (*aa*).
Wall furred or lathed with wood, space between lathing and wall shall be filled with plaster at top and bottom side of floor beams of each story and ceiling joist of roof.

Wilmington:—(*dd*); (*ee*).

Compiled by Henry A. Phillips.

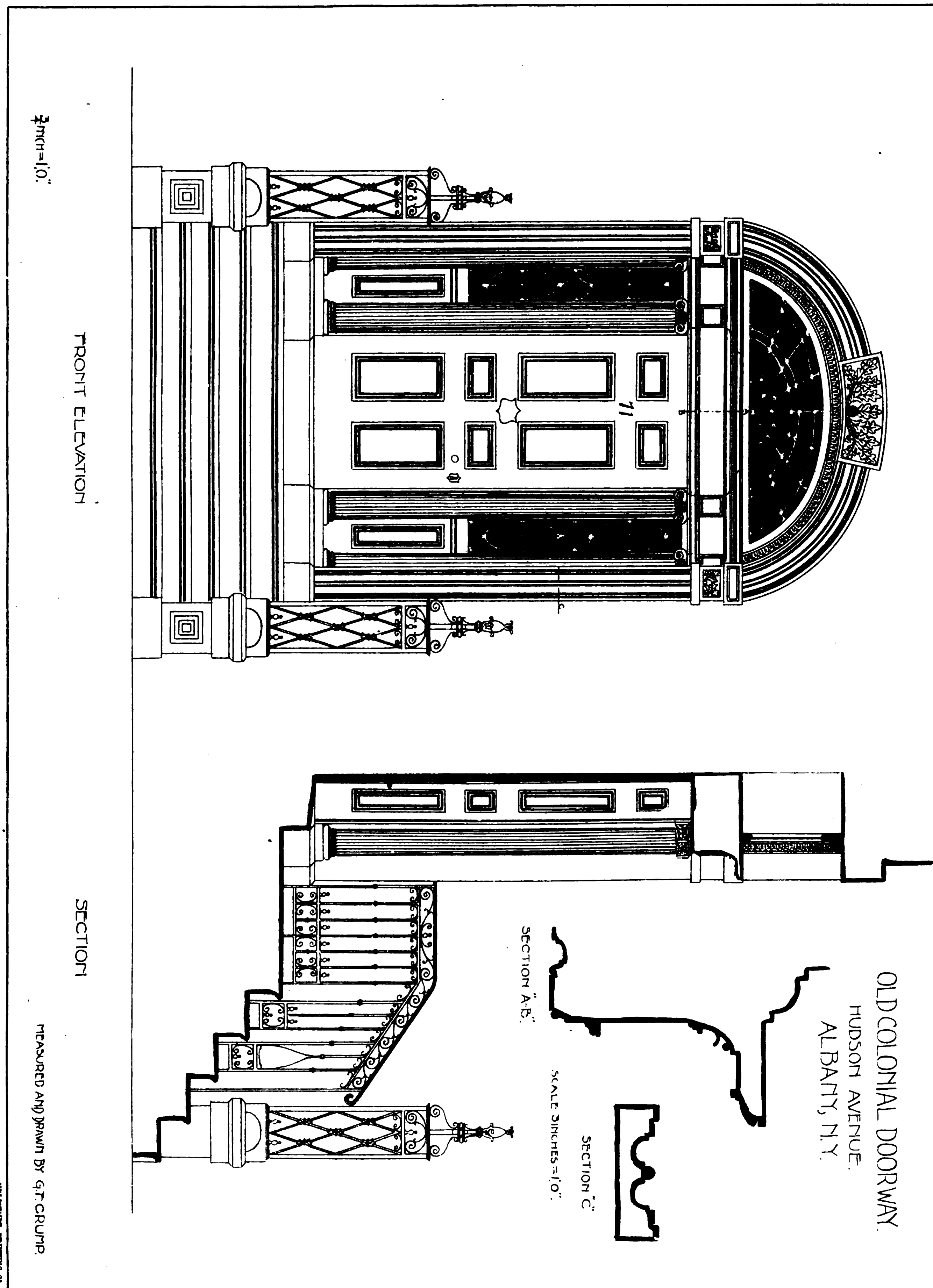
A Giant Magnet.—We have heard of a bold and costly undertaking which an eminent personage, still living, projected in his youth. He caused a magnet to be built of such size and power as had not yet been imagined. It was his intention to charge this gigantic object without witnesses, so as to enjoy the unparalleled result in selfish solitude. Happily, a great authority called at the moment and received an invitation to assist. When he saw the preparations his face paled. Neither he nor any one else could foretell what would happen if that twenty-foot magnet were set to work; but it was probable, at least, that the house would fall. The thing still remains uncharged, or did a few years ago.—*The Saturday Review.*


East Elevation
North Elevation
TOWN HOUSE for MR –
B. F. Willis, Architect, York, Pa.


Parlor
Hall
FIRST FLOOR PLAN
Chamber
Balcony
SECOND FLOOR PLAN
RESIDENCE of S. TAYLOR.
NEAR WINTERS CALIFORNIA
Percy and Hamilton, Architects


"ALTON" NEAR SILVER SPRING MD.
RESIDENCE OF CROSBY S. NOYES ESQ.
W. J. MARSH ARCHT.

AMERICAN ARCHITECT AND BUILDING NEWS, JAN. 7 1893. No. 889.



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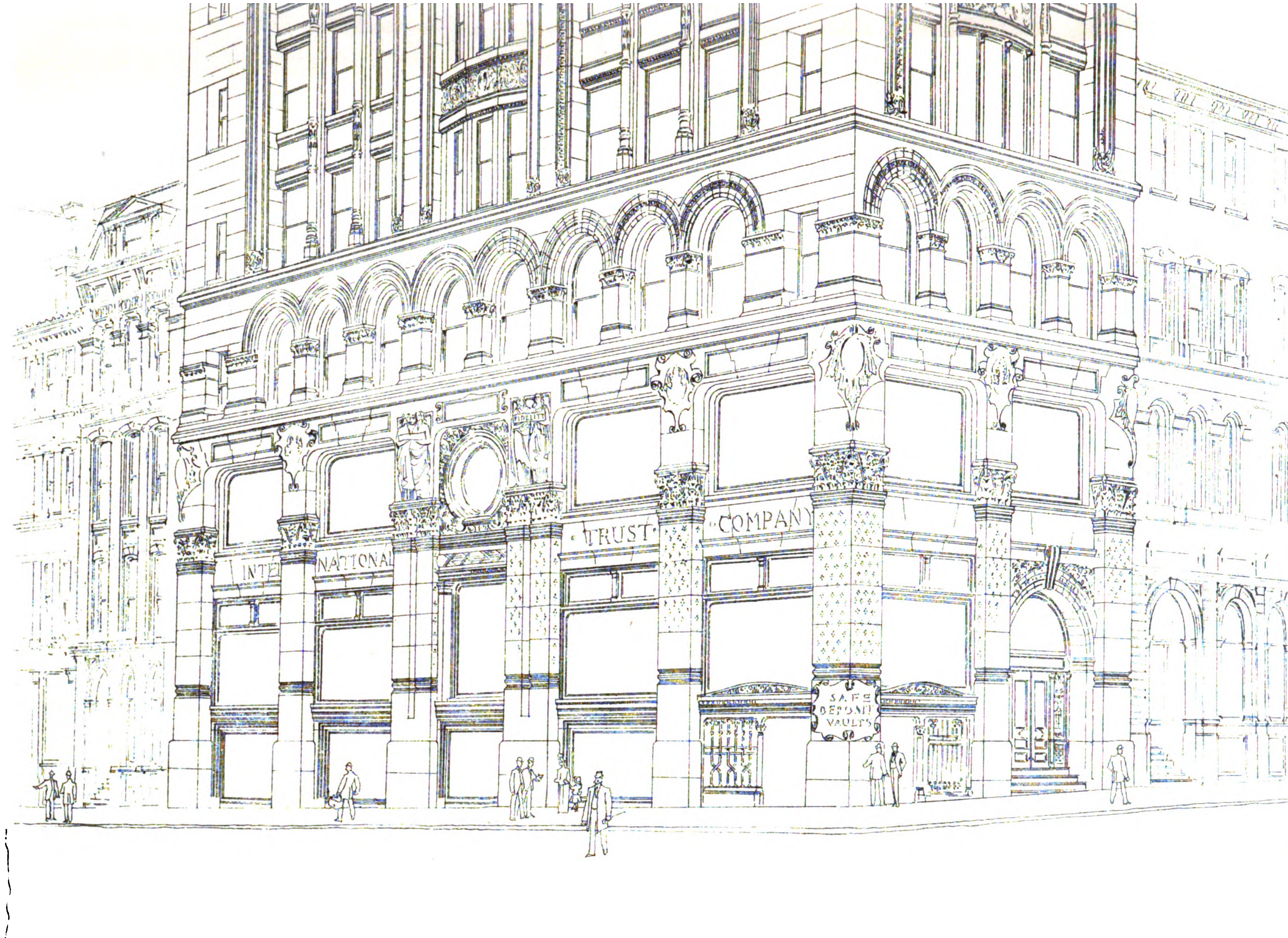

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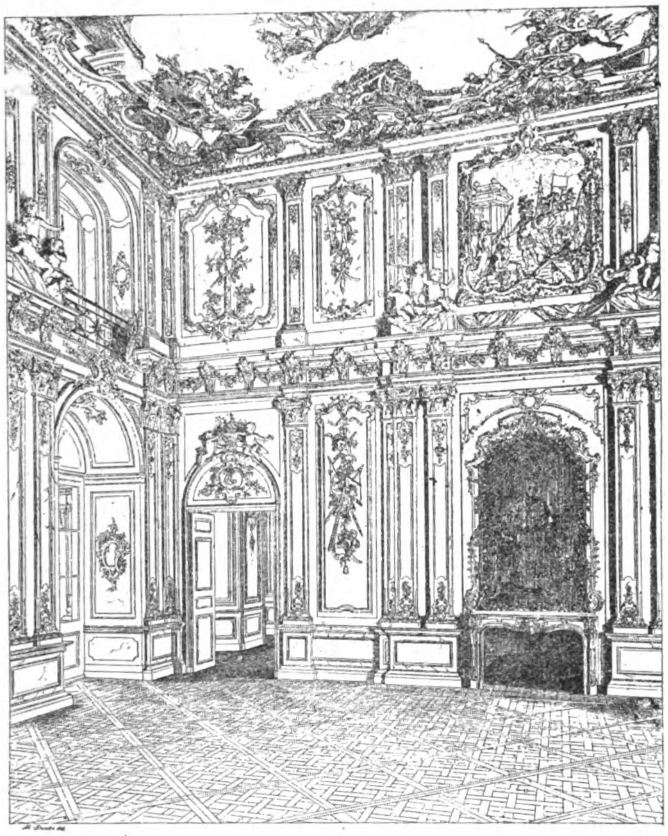
American Architect and Building News, Jan. 7. 1893.

A DISTINCTION IN THE ACOUSTIC PURPOSES OF PUBLIC BUILDINGS.[1]



Saloon in Schloss Bruchsal: Balthazar Neumann, Architect. From *Der Formenschatz.*

THERE is I think no department of our profession in which so much uncertainty prevails as in reference to the properties which in the designing of any building shall insure good acoustic results either for public speaking or for music. It would, of course, be impossible for me in a single paper to deal at all at length with the general subject of the acoustics of public buildings, and I therefore propose to confine myself, as the title of my paper implies, to the discussion of an important distinction in the acoustic purposes of public buildings, by showing that there are essential differences in certain acoustic elements between buildings intended principally for public speakings and buildings intended principally for music. I have said "principally" in both cases, because, while, of course, certain buildings, such as lecture-theatres, law-courts, legislative assembly-halls, etc., are certainly not intended for any other purpose than speech, and while also on the other hand certain buildings, such as our modern mammoth concert-halls, are, as far as acoustics are concerned, intended almost solely for music, there are other buildings, such as theatres, churches, etc., in which the question of compromise between the two purposes has to be considered. Being, as those of you who know me are aware, the organist of one of our larger city churches, and taking a very warm amateur interest in music, you will readily understand that this subject naturally appeals very strongly to me more especially upon its musical side. Many of you may possibly be able to recall instances of rooms or buildings which while favorable for speaking have been unfavorable for music, and of rooms which though difficult to speak in have been flattering to music. To illustrate what I mean, and as an indication of the question which I wish suggestively to bring before you this afternoon, let me here, before proceeding to discuss the subject in its proper order, quote two examples which helped very strongly to impress upon me the distinction I wish to emphasize. In December, 1878, Herr Kretschmann organized in Sydney a series of grand musical recitals in honor of Beethoven, and obtained the use of our University great hall for them. This was I believe the first occasion on which this hall had been used for music since the inaugural musical festivals held in it at its opening in 1858 or 1859, and some of us, who as late undergraduates had had ample opportunity for discovering how bad the hall was for public speaking, thought that it must necessarily be equally so for music. To our surprise, however, we discovered that quite the reverse was the case, and that soloists, whose voices were so familiar to us as to supply a standard for judgment, were heard to more than usual advantage, and that the lighter orchestral music was distinctly audible even at the extreme end of the hall. On the different nights of these performances, I sat in entirely different parts of the hall, intentionally changing my seat after the first night to various positions, to verify its unexpectedly good musical properties. Some of the principal soloists also, to whom I afterwards spoke on the subject, confirmed my opinion, and stated that they also were surprised at finding how pleasant a building it was for them to sing in. On further inquiry I learned that the same favorable impression of its musically acoustic properties had been formed at the inaugural festival twenty years earlier. Through the courtesy of Mr. Cyril Blacket I have obtained the dimensions of this hall, but it will be better to discuss these later in their proper place. Still more recently another illustration of the flattering effect upon solo-singing produced by a building was impressed upon me in connection with one of our ecclesiastical buildings (which is certainly not favorable to public speaking) where shortly after the arrival of a cultivated soloist who, at that time was often to be heard there, I had several opportunities of listening to him with great enjoyment. A very little later I heard him in one of our concert-rooms, as well as three or four times in private, and on each of these later occasions, while all the cultivation was still evident, the apparent difference in the quality of tone was such, that I thought with some disappointment that I had previously over-rated his voice, until still later on hearing him again under the first conditions, I noted that the voice had recovered its apparently lost charm, and discovered that the building rather than the singer was responsible for the difference. These two illustrations will, as I have said, serve to indicate the more especial question which I wish suggestively to lay before you this afternoon, for, of course, to attempt anything like an exhaustive inquiry into the general subject of building acoustics would, as I have said, be impossible in the short time at my disposal. In discussing any question in connection with building acoustics, one cannot but feel much regret and some degree of astonishment, that this branch of applied, or perhaps I should say unapplied, science should be still in the unsatisfactory conditions of uncertainty in which it is, and that there should be so little published teaching upon it, for while we have several modern treatises on sound, the only English text-book on applied acoustics that I know of is Mr. Roger Smith's very interesting little book, the remaining published matter on the subject consisting of papers and articles, some of which are almost more embarrassing than helpful from the diversity of their advice. I propose to divide my subject by — 1st, stating and defining such of the laws affecting the propagation and transmission of sound as bear upon it; and, 2d, distinguishing in their application to buildings between those which appear more especially to afford favorable conditions for public speaking, and those which appear to afford favorable conditions for music. In what I have to say I shall avail myself largely of Professor Tyndall's and Doctor Stone's treatises on "*Sound,*" and of Mr. Roger Smith's little manual, though I shall adopt a somewhat different classification and order to the last named. First, then, to state and define such of the laws affecting the propagation and transmission of sound as bear upon my subject. 1. Sound is the effect upon the ear of an undulatory or wave-like motion of the particles of an elastic medium, caused by the vibration of an elastic body. Sound may be generated in various ways, *e. g.*, by shock, explosion, friction, etc., but it only becomes sound to us when there is some elastic medium of conduction to convey to our ears the motion set up by the generating body. This may be illustrated by the well-known experiment of causing a bell to be struck under the exhausted receiver of an air-pump, when no sound is audible. The most common medium of conduction is, of course, the atmosphere, the elastic particles of which undergo a wave-like motion, being alternately compressed and rarified, each individual particle communicating its impulse to its neighbors, but with very little forward movement of the particles themselves. As Doctor Stone says: "There is nothing resembling the flight of a rifle bullet between the source of sound and the auditor's ear." Of course, the waves of sound issuing from a sonorous body in an uninterrupted medium, like the rays of light from a candle, must not be regarded as moving merely in a linear direction. It is true that both in the case of sound and of light, the communication between the producer and the recipient takes a linear form, but the real constitution of the unconfined wave is spherical, though owing to the modifying influences of original direction and variation of atmosphere, quite apart from the alteration by obstacles, this spherical form probably exists absolutely only in theory.

2. Sound may be classified as of *unperiodic* vibration and of *periodic* vibration. I put this classification thus early because it is at this point that the distinction, which is the special subject of my paper, begins. Single separate vibrations acting upon the tympanum of the ear, I will, for the want of a better term, define as "*dissonant,*" by which I do not necessarily mean discordant, sounds, while those which act with continuous regularity of vibrations I will call "*consonant.*" Professor Tyndall, in distinguishing between noise and music, says: "The pulses which produce noise are of irregular strength and recurrence." And, again: "The only condition necessary to the production of a musical sound is that the pulses should succeed each other in the same interval of time," and, he adds: "No matter what its origin may be, if this condition be fulfilled the sound becomes musical. If a watch, for example, could be caused to tick with sufficient rapidity — say, one hundred times a second — the ticks would lose their individuality and blend to a musical tone." Every schoolboy knows how to produce a note or tone with his slate-pencil; holding the pencil vertically and somewhat loosely between the fingers, on moving it over the slate a succession of taps is heard, by pressure these taps can be caused to succeed each other so quickly as to produce a continuous sound, which, though we can hardly call

[1] A paper read before the Sydney Architectural Association by Mr. H. C. Kent, M. A., and published in *S. A. A. Notes.*

it melodious music, is still decidedly a note or tone. The production of a musical sound by taps has been often illustrated by causing the teeth of a rotating wheel to strike in quick succession against a card. From this, then, we see that dissonant sounds may become consonant or musical by repeating them with a periodic velocity. Speaking and singing may, I think, be said to differ in kind in this particular, although, of course, there are degrees of regularity of vibration in speech, depending upon the mode of uttering and sustaining words, and speech may of course itself shade into singing, as, for instance, in intoning, to which I shall allude again later on. In confirmation of what I have just said as to speech belonging to the class of sounds of unperiodic vibration, I will quote again from Professor Tyndall, who, speaking of the celebrated scientist, Dr. Robert Hooke, and quoting from "*Birch's History of the Royal Society,*" published in 1757, tells us that "Mr. Hooke showed an experiment of making musical and other sounds by the help of teeth of brass wheels, which teeth were made of equal bigness for musical sounds but of unequal for vocal sounds"; and again, quoting from Richard Waller's "*Life of Hooke,*" that "he [Doctor Hooke] showed a way of making musical and other sounds by the striking of the teeth of several brass wheels proportionately cut as to their numbers, and turned very fast round, in which it was observable that the equal or proportional strokes of the teeth, that is two to one, four to three, etc., made the musical notes, but the unequal strokes of the teeth more answered the sound of the voice in speaking." The question of the generation or production of sounds of periodic vibration brings us, of course, at once to the musical side of our subject, and here I feel it necessary to put a restraint upon myself, as this subject of musical vibration is so wonderful and fascinating that to deal with it at all, as it deserves, would mean writing a book rather than a paper. To any of you who care to follow it, I would, in addition to Doctor Stone's book, commend a very charming little book on "*The Theory of Sound in its Relation to Music,*" by Professor Blaserna. I shall necessarily deal with this portion of my subject more fully when speaking of the Pitch and Reinforcement of sounds. Under the present head I will content myself with stating merely that musical sounds may be generated by shock or friction setting up vibration: (*a*) In plates, bars, or strings of metal and other fibrous strings. (*b*) In columns of air. Under the first head we may class bells and all stringed-instruments, and under the second head all wind-instruments. Having so far, then, distinguished between sounds of unperiodic and periodic vibration, let us next in order note that:

3. The sound is transmitted at a uniform rate of velocity in the same medium, but with constantly diminishing intensity. The velocity of sound in air is about 1,090 feet per second at 32° F., or about 1,120 feet per second at 60° F., *i. e.*, about twelve and one-half miles per minute. In water the velocity of sound is about four and one-third times as rapid, but there is considerably more loss in resonance. In wood and in metals the velocity of sound is very much greater still; the velocity of sound in the atmosphere, as we should expect, is affected by the density of that medium, and therefore varies slightly with the temperature, as indicated by the above figures, as well as with the humidity. The degree of intensity of sound is due to the force of the original movement, to the distance through which the vibrations have acted, to the directness of their line of action, and the density of the medium. The intensity, or loudness of a sound, does not alter the measurement from crest to crest, which we call the wave-length of each vibration, but causes greater or less amplitude in each undulation. It will be readily understood that the intensity of sound diminishes as it becomes more and more extended, inasmuch as the original impulse is spread over a constantly increasing area, so that the quantity of it which strikes upon any given point will be proportionately less. As with light, so with sound, the intensity in an unconfined medium diminishes as the square of the distance. The diagram on the wall, copied from Dr. Stone's book, will illustrate the diminution in intensity of a sound-wave through an unconfined medium. You will observe that while the wave-length is the same, the amplitude of each undulation diminishes as it recedes from the source. The diminution of intensity may of course be modified by preventing the sonorous wave from spreading equally in all directions, *e. g.*, if it be confined to a tube, it may travel for long distances with but very slight loss of intensity. The ordinary office speaking-tube is a familiar example of this.

4. Sounds differ in pitch and in quality. The pitch of a sound is that characteristic by which we distinguish it as being shrill or deep, or as we are accustomed to express it in music as being high or low. We have just seen that the intensity or loudness of a sound depends on the amplitude of its vibrations. The pitch of a sound depends entirely upon the greater or less rapidity of the vibrations, the greater the rapidity the more shrill the sound, so that pitch and intensity are entirely distinct. The characteristic of pitch will be clearer to you after an examination of the manner in which strings and columns of air vibrate. [The lecturer then dealt with the method of vibration of strings and columns of air and showed how from the subdivision thereof are obtained the fundamental tone and its harmonics, and the simple numerical ratio of vibration which these bear to each other.] If you have followed me in what I have just said as to the manner in which the strings and columns of air vibrate you will now be better able to consider the subject of *Pitch.* The pitch of a sound, as I have already said, depends entirely upon the rapidity of vibration. When notes from entirely separate sources are of the same pitch their rates of vibration are the same. If, for example, a string, a tuning-fork, an organ-pipe and the human voice yield notes of the same pitch, it is because the vibrations in each case are of the same rapidity. This is capable of absolute proof by means of a most interesting instrument invented by Cagniard de la Tour, and which is called "the Siren." [The lecturer then showed how from "the Siren" can be obtained the relative vibration values of a note and its harmonics, confirming their ratios; then he dealt with the audible limits of pitch, showing by table the approximate limits of audible notes and the range of instrumental and vocal music; next he showed how from pitch can be deduced the wave-length of a sound and the length of an organ-pipe of this note, and then described the phenomenon of the interference or beats of discordant notes, and afterwards briefly referred to the variations in musical standard pitch.] I fear you will think that I have dwelt at undue length under this heading of pitch, but you must remember that I have included therein the explanations of the mode of vibration of strings and columns of air, in addition to which I have been anxious to sufficiently emphasize the dependence of harmonies of musical tones upon simple numerical ratios. Thus far we have seen that the sensation of musical tone is due to a rapid, perfectly periodic vibration of the sonorous body, and that of noise to less periodic or unperiodic vibration; and, further, that the intensity of any sound is due to the width or amplitude of its vibrations, and the pitch of it to the frequency, *i. e.*, to the length of its vibrations. We next proceed to discuss another characteristic of sound which is generally defined as quality.

Quality. — We have said that sounds differ in *quality.* The quality of a sound is principally due to the nature of the substance which emits it, though it is also more or less slightly affected by the nature and condition of the transmitting medium. Examples of distinction in quality may be illustrated by the difference in effect upon our ears between a blow struck upon different substances, or by the difference in music between a note of the same pitch sounded upon a wooden flute and upon a brass horn. The French call this difference "*timbre,*" and the Germans call it "*klangfarbe*" (clang-tint). We are all, of course, perfectly familiar with the difference, but possibly not so familiar with what constitutes it. As it does not bear so much upon the practical side of our subject, I shall not dwell upon it longer than is necessary to indicate the lines of the constitution of this difference. In explaining to you the vibration of strings and columns of air, I stated that co-existent with the fundamental vibration we always have proportionate smaller vibrations going on, so that in reality we always hear a note more or less enriched by its harmonics, and it is to these affiliated or subordinate waves producing co-existent harmonics, or overtones, or upper partial tones, as they are sometimes called, that is due the character or quality of any sound. If we could make the vibrations of sound suddenly visible, we should, doubtless, find that although the wave-lengths of different sounds of the same pitch are equal, the varieties in subordinate form are practically infinite, the main waves being accompanied by smaller waves, and broken into what would probably appear as differing ripples of differing amplitude and form — rounded, pointed, and of all sorts of form, possibly including spirals. Professor Tyndall, in justifying the use of the terms *over-tone* and *klangfarbe* (clang-tint), makes a suggestive comparison between the varying vibrations of light and those of sound, productive of compound colors in the one and combined tones in the other. This characteristic which we call the *quality* of musical sounds is treated at some length by Dr. Stone, who tells us that "musically, there are very few cases in which the sound of a resonant body consists of a simple tone, the chief instances being tuning-forks, mounted on a sounding-box, and large-stopped organ-pipes very gently blown." And, again, that "the sensation of a musical tone is compounded out of the sensations of several simple tones, the prime tone being louder than any of the upper partial tones, and hence alone determining the pitch." And, once again, that "even when these upper partials are not separately perceived because they fuse into the whole mass of musical sound, their existence in our sensation is estabished by the difference in the quality of the tone." When speaking previously of harmonics I showed that when the note C, for instance, is sounded, it introduces, besides its octave, the new notes, G and E, and these, of course, produce, in a fainter degree, further upper partials; and thus, out of what we usually call a single note, we really hear a compound tone, which, if its upper partials are more strongly marked, is more brilliant, as in bass instruments; and if less strongly marked, is less brilliant, as in wood tones. I might go farther than this, and explain that combinations of tones give rise to still further tones, which we call resultant tones, but I think enough has been said under this head to show you that through its dependence upon the sounding of harmonics the *quality* of what we call individual tones, as well as the harmony of combined chords, is intimately connected with the simple ratios of numbers.

5. Sound is subject not only to conduction, but also to *reflection, deflection, refraction* and *absorption.* As already stated, all sound only becomes audible to us by *conduction.*

Conduction. — Although the most common medium of conduction is the atmosphere, any elastic medium will convey sound, and the higher the elasticity of the medium, the greater the velocity of conduction: *e. g.*, as has already been stated the velocity of sound through water is about four and one-third times as rapid as through air, and in wood (along the fibre) and in the harder metals it is much greater still, being in iron as much as fifteen times as rapid as

in air. The conductions of sound can, as I have also previously stated, be greatly assisted by preventing its spreading equally in all directions, as for example in an office speaking-tube, or in a speaking-trumpet. The possibility of the conduction of sound by the conversion of its vibrations into electric vibrations and *vice versa* is shown in that most wonderful recent discovery, the modern telephone. Mr. Roger Smith tells us that the phenomenon of the whispering-gallery of St. Paul's is due to conduction, his explanation being that the whisper spoken by any one with his face turned towards the wall and close to it is conducted at the same time in two opposite directions along the smooth surface of the interior of the circular drum below the dome, and that thus the two conducted sounds, arriving by opposite paths at the other side at the same moment, reach there with but very little loss of intensity, so that a listener at that spot will hear a sound twice as loud as at any other part of the circuit. If this explanation be correct, Doctor Stone and Professor Blaserna are in error in ascribing the phenomena to reflection from a focus of one curve to a focus of another curve.

Reflection. — The reflection of sound is one of the most familiar of the phenomena in connection with acoustics. Sound in this respect follows to a certain extent only the same law as light, the angle of reflection being equal to the angle of incidence only when the angle is greater than 45°, for according to Mr. Scott Russell when the vibrations strike at an angle between 45° and 30° they are not perfectly reflected at an equal angle, and when striking at an angle more acute than 30° they are not reflected at all, but are conducted along the surface of the object in the same way that a water wave when striking against a bank at a very acute angle glides along it instead of being reflected by it. To this power of reflection, of course, is due the well-known phenomenon of echo, one of the most annoying of the effects of a bad acoustic building. The velocity of sound being, at an ordinary indoor temperature, about 1,120 feet per second, and experiment having shown that about five syllables are produced in one second, and that therefore the time length of a syllable is about one-fifth of a second, in which time sound would travel over 224 feet, it follows that if a reflecting wall be 112 feet distant, one syllable, taking one-tenth of a second to reach the wall and one-tenth of a second to return to the observer, in all one-fifth of a second, would be reflected just a syllable of time after the sound uttered. Now, if the distance be twice as great, *i. e.*, 224 feet, we might get two clear syllables reaching the observer by echo, and at three times the distance, three syllables, and so on. An echo may also be multiple when the sound is reflected from two parallel walls, at a sufficient distance from each other. Professor Blaserna tells of a case near Milan, where a building with two parallel wings repeats the report of a pistol as often as thirty-two times. As with light and heat, so also with sound, when the lines of vibration strike upon a concave surface they will be reflected to a focus, and conversely if the sound emanates from the focus of a concave surface it will be reflected to the more distant point, in which case, of course, its intensity will not diminish as the square of the distance. Professor Tyndall tells of a case cited by Sir John Herschel, in connection with a Silician cathedral, where the confessional was so placed that the whispers of the penitents were reflected by the curved roof, and brought to a focus at a distant part of the edifice. The focus was discovered by accident by a man, who for some time afterwards entertained himself and his friends with listening to utterances only intended for the priest's ear. One day, however, his own wife being the penitent, both he and his friends were made acquainted with secrets, which, however entertaining to his friends, afforded anything but amusement to himself. The similarity of reflection between heat or light and sound from concave surfaces is very strikingly shown in the case of two parabolic mirrors, which, from the nature of their curves, reflect any lines striking on them from their foci away in parallel lines. Probably many of you have seen the familiar experiment of reflection and concentration of light and heat from a pair of parabolic mirrors placed a long distance apart, and the parallel experiment of hearing in the focus of one mirror the ticking of a watch placed in the focus of the other. Efforts have been made to utilize this property of reflection from parabolic curves, so as to prevent echo, for of course you will see that from a parabolic surface there could be no echo except at the focus, and even at this point the distance the reflected waves travel will be comparatively so short that the interval between the direct and the reflected sound will be scarcely, if at all, perceptible.

The Deflection of sound is due to the spreading again of the waves of vibration after they have passed some obstacle in their course. You must all be familiar with the phenomenon of sound shadows, as they are called, *e. g.*, in the case of an obstacle intervening between an auditor and a church bell. As you retreat from such an obstacle, even though it remains in the same direct line between you and the sound, it ceases to have so marked an effect, because the waves have spread again round it.

The Refraction of sound, that is, the bending of it when it enters a medium of different density, is a phenomenon analogous to the refraction of light, and doubtless plays a part in the acoustics of buildings from the different density of the layers of the atmosphere caused by heat and wind currents.

The Absorption of sound by a soft or yielding surface is a phenomenon analogous to the absorption of light by a dark surface. A familiar illustration of the absorption of sound may be found in the diminution produced in the resonance of a room by furnishing it, especially when curtains, and hangings, and carpets are introduced, or by the filling of a hall with an audience. I myself have a constantly recurring experience in the absorption of sound, for in playing the concluding voluntary in the Pitt Street Church when there has been one of the huge congregations that we sometimes have, I can clearly feel the gradual difference in resonance as the people depart, indeed, I think even if I were blindfolded I could almost tell from the organ whether there were a packed or a moderate or a sparse congregation.

(6) *Sound is capable of reinforcement by setting up a vibration in bodies which will vibrate to the same note.* One of the simplest illustrations that can be given of this characteristic of sound is that of striking a tuning-fork and then bringing the end of it in contact with the body of a violin or the sounding-board of a piano when a most perceptible reinforcement of sound will be obtained. A less familiar, but perhaps more striking illustration is afforded by striking the tuning-fork and then holding it over a long glass jar and gradually shortening the column of air in the jar by gently pouring in water, when suddenly at a certain point the reinforcement bursts out into distinct tone. An exactly parallel example to the last named is obtained by striking a tuning-fork and bringing it to the opening of an organ-pipe of the same note, when the reinforcement is heard, whereas if we bring it to the opening of another organ-pipe there is little or no reinforcement, and if any number of different tuning-forks were struck and placed in the same pipe at once the pipe would respond only to that of its own note and its harmonics. This law of what we may call *sympathetic vibration* is from a musical point of view of the greatest importance. You have already seen, when we were discussing the vibration of columns of air, that the tone of an ordinary organ-pipe is due to the sympathetic vibration of a column of air upon an original vibration produced by blowing against an intercepted film of air at the *embouchure.* Similarly in reed pipes the tone is due to the sympathetic vibration of the column of air upon the vibration of a small tongue of metal. Similarly in all wind-instruments the tone is due to sympathetic vibration of the column of air upon an original vibration produced by *embouchure,* by reed or by lip tension. All wind-instruments, therefore, depend for their tone upon this law of sympathetic vibration. This law of sympathetic vibration, however, not only gives their tone to all wind-instruments, but equally so to all stringed-instruments which depend for their tone upon the power of exciting sympathetic vibrations, either first upon thin wood, and thence upon enclosed masses of air of special dimensions, bearing simple ratios expressible by the numbers 1, 2, 3, 4, 5, 6, so that they may respond to every possible note, as in the violin and all kindred instruments, or else upon specially constructed wooden sounding-boards, made of such shape as also to respond to all notes, as in a piano. You will see this at once, for without the resonance-chamber of a violin, or the sounding-board of a piano, the strings of these instruments would be feeble in the extreme, and the variations which make one violin or one piano so much more valuable than another for musical purposes do not lie in the strings themselves, but in the special success or otherwise in the construction and dimensions of the reinforcing body which they throw into sympathetic vibration. Now every mass of enclosed air in an apartment may for musical purposes be regarded to a certain extent as a resonance-chamber. If then the ratio of numbers plays so important a part as we have seen it does in the resonance-chambers of the instruments which produce musical notes, surely the relation of simple ratios in the dimensions of the hall or room in which the music is to be heard must also play some part in both the quality and reinforcement of musical sounds. Having thus far stated and defined such of the laws affecting the propagation and transmission of sound as bear upon our subject, I now turn, as I am sure you must think it time I did, to the second part of my subject, which is:

(II) To distinguish, in their application, between those which appear more especially to afford favorable conditions for public speaking, and those which appear to afford favorable conditions for music. Mr. Roger Smith, in treating of the obstacles and auxiliaries which buildings may present to sounds, says that he has heard it expressed as a deliberate opinion by one of the greatest living authorities on acoustics that there is no possible building equal to the open air for perfection of hearing. If this should really apply to public speaking (and, considering how much sound must be lost overhead, it ought not even to apply to this), I venture to say, even in the face of so great an authority, that it certainly does not apply where music is concerned. Let us, then, in considering this distinction in the acoustic purposes of buildings, deal first with buildings for public speaking.

(1) *Buildings for Public Speaking.* — In inquiring which of the laws of sound just considered apply to buildings for public speaking, it must first be noted that such building may have an outline approaching a semi-circular or horse-shoe shape, or may be rectangular in form. In either case some limit of size must, of course, apply, and this must be obtained from some definite results of past experiment or from fresh experiment. Mr. Roger Smith tells us that the experiments on this subject undertaken by Saunders and recorded by him in his book on theatres gave as a result that, when a person was made to read from a book on a still day upon an open plain, he could be heard 92 feet in front, 75 feet each side and 31 feet behind, and the bounding line shown as denoting these limits was a flattened circle having a radius of 75 feet all round, excepting in the rear,

where the radius would be shortened to 41 feet. Sir Christopher Wren, in a letter on church-building, however, Mr. Smith goes on to tell us, gives a much more limited range, and says that a moderate voice may be heard 50 feet distant before the preacher, 30 feet on each side and 20 feet behind the pulpit. Rhode, in his book, assigns a limit intermediate between the two above named, and considers that a theatre will be within the range of the natural direct radiation of sound where no person is farther than 70 feet from the speaker, and that such a theatre would occupy about 6,000 square feet of ground, and would seat about 1,000 persons on the ground floor and about 2,000 altogether, including galleries. I think that the profession would be glad to have this question more fully experimented upon by a committee of scientific experts for the establishment of something like a definite rule. Next, in considering the application of the laws of sound, it must be evident that if the first requirement in the acoustics of a building for public speaking is that its limit of size shall be such as to bring all auditors within the range of the voice, the second requirement is that there shall be nothing to mar the distinctness or separateness of enunciation. Anything, therefore, that tends to sustain or prolong the vibrations of separate syllables so as to fuse them into one another, however much it may improve the quality or tend to reënforce the musical tone of a voice, will be detrimental to speaking, as tending to destroy distinctness. Hence I think we must conclude that we cannot hope to improve by any aid from a building the natural voice of a speaker, which is, perhaps, the half-truth enunciated by Mr. Roger Smith's quoted authority when he said that no building is equal to the open air for perfection of hearing. If, however, we cannot improve the natural voice, we can surely do something towards preventing its loss in undesirable directions. The problems, therefore, I think to be solved in connection with buildings for public speaking can, perhaps, best be stated in negative terms as follows:

(*a.*) To avoid such dimensions as will tend to undue resonance.

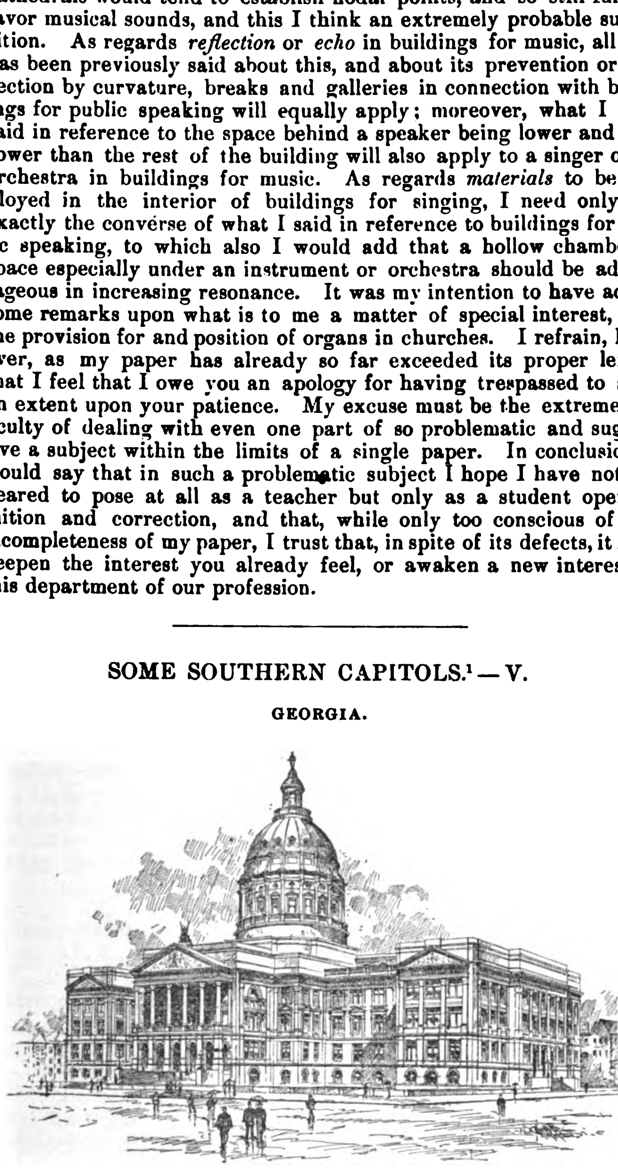
(*b.*) To avoid all arrangements and material that may obstruct or absorb or reflect in wrong directions the vibrations that should strike directly from the speaker upon his audience. Undue height, as compared with other dimensions, must, therefore, be avoided, as it will tend not only to resonance, if it be in harmonic proportions with the other dimensions, but also to absorption of sound overhead, and to risk of reflection from a high ceiling. A large amount of air behind a speaker must also be avoided, on account of its tending to absorption in a wrong direction. It appears to be agreed, as the result of experience, that it is advantageous for a speaker to have a little space behind him, but this space should be lower and narrower than the rest of the building; and, speaking generally, it would appear to be right to diminish the volume of air contained in a building for public speaking to the smallest amount compatible with good proportion and the preservation of free space for the sound to penetrate direct to every part. Concave parabolic reflectors have been sometimes placed behind a speaker to give greater effect to his voice, but they necessitate his always standing exactly at the focus; and, moreover, they have the great disadvantage of bringing all the whisperings and other slight sounds produced in the room and reflecting them in a concentrated form in the speaker's ear, for which reason they have been generally discarded. As a corrective in cases where there has been too large a volume of air over a speaker's head, a convex reflector has, however, been frequently used with advantage to prevent the sound being unduly absorbed in an undesired direction. This was done, Mr. Roger Smith tells us, very successfully by Mr. Penrose in St. Paul's Cathedral, when, a temporary pulpit having been erected under the dome, it was found necessary to prevent the voice from ascending and being lost in the dome. It is never well to elevate a speaker much above any part of his audience, as the voice can be thrown upward with much less effort than downwards. The floor of the auditorium should, therefore, when possible, be made to slope upwards, and the seats ranged one above another, and, if this rising line be set out upon a concave curve, determined by grading the seats to a definite gauge by radiating lines drawn from the speaker, as recommended by Mr. Scott Russell, and called by him an "Isacoustic Curve," it would seem to afford the best possible arrangement. In constructing a dramatic theatre, however, for a very large audience, the stepped seats must, to some extent, be superseded by tiers of galleries, but in each separate part of these the stepped arrangement can be adopted. As regards reflection or echo in buildings of a theatrical form, there will not be much risk from the wall, inasmuch as the stepped arrangement of the auditorium and the galleries, and the absorption by the occupants, will so break the direct lines of vibration as to prevent reflection from the walls; while if the ceiling be formed on a cove which has its focus close to itself, there can be no reflection back to the audience from it. In the buildings of rectangular, oblong form, however, the risk of reflection or echo is much greater, as, in addition to the direct echo from the end wall, and, if lofty, from the ceiling, also, we shall have to guard against the secondary reflection or echo when the conducted sound reaches the angles formed by the walls, and the angles of the ceilings with the walls. In such buildings, direct echo from the opposite wall can be largely obviated by such expedients as making the end wall elliptic, and by breaking it with recesses or with a deep stepped gallery, and even by such expedients as by using absorbent materials, such as draperies, while secondary echoes can be largely obviated by cutting off the rectangles with a curve, as well as by slight breaks in the side walls, which will prevent the conduction of the waves along their surface; direct echo from the ceiling may be prevented as in the previous case. I have said by slight breaks in the side walls, because deep, square recesses in the walls, excepting at the end opposite the speakers, and deep, square openings in the ceilings, also, such as lanterns, should, as far as possible, be avoided, as these will have a tendency each to set up its own little column of sonorous air, and to create, in this way, a set of conflicting vibrations. Thus far I have been treating of buildings for use by public speakers from a simple position, but there are other public-speaking apartments, such as legislative-chambers and law-courts, in which the sound has to proceed from various positions. Of these, law-courts, of course, present the simpler problem, inasmuch as the points of sound-propagation are fewer and more definitely fixed; for example, the bench, the barristers' table and the witness-box. So far as I am aware, these have very seldom, if ever, had a curved outline on plan, and in most cases are much too lofty for speaking purposes, and are frequently further acoustically ruined by ceiling-lanterns. From the comparatively limited dimensions necessary for a law-court, it ought not to be by any means an impossible problem to design a thoroughly satisfactory model, and I commend it to any of you who desire to win renown. As regards the materials to be employed in the interior of buildings for speaking, such as ceiling and wall linings, etc., it seems to be generally recommended, without discrimination between such buildings and buildings for music, that as much wood lining as possible should be used. Although this seems to be the prevailing opinion, I yet humbly venture to think that, however suitable the predominance of such materials may be in buildings for music, they are likely, by increasing resonance, to detract from the clear definition and distinctness which are the first requisites in a building for public speaking.

2. *Buildings for Music.*—Judging from the emphasis which in the first portion of my paper I have laid upon the relation of simple numerical ratios to the quality and reinforcement of musical tones, you will not be surprised to hear me express a very strong opinion in favor of harmonic proportions in the dimensions of buildings intended for music, and a desire for further scientific investigations as to what proportions will yield the best results. From what I have previously said it must be evident to you that in the production of musical sounds simple harmonic ratios in dimensions are of the most essential importance, *e. g.*, in the body of a violin, etc. Inferentially, therefore, they surely must, to say the least of it, be not unimportant in the transmission of musical sounds. Of course I am aware that such inferential argument is not proof, but I believe I am correct in saying that the few examples that can be quoted appear so strongly to support this theory as to very materially strengthen such argument, and to make us desire further efforts in the same direction. Mr. Roger Smith quotes two examples of very large halls which have proved exceptionally successful for music. The first of these is the Free Trade Hall at Manchester, the dimensions of which he tells us are: height, 52 feet; width, 78 feet; and length 130 feet; *i. e.*, in the ratio of 2 to 3 to 5. The second is the Surrey Music-Hall, the dimensions of which are in the ratio of 2 to 2 to 5, that is of the extreme dimensions; this latter building, however, of which Mr. Smith gives sectional drawings, has a central area with a clearstory, the galleries being under lower wing roofs all around, and if the proportionate dimensions of this central area be taken, as I think they should, they show the ratios of 2 to 3 to 6, viz: width, 45 feet; height, 67.6 feet; and length, 145 feet, which I think very instructive as an example. Strange to say these dimensions are almost exactly the same that Mr. Cyril Blacket has given as the dimensions of our own University Hall, to which I referred in my opening remarks, his figures being, width, 45 feet, height, 68 feet, and length, 135 feet. Mr. Roger Smith quotes one room of smaller dimensions, viz: a music room in Edinburgh, designed by Professor Donaldson, where the principle of harmonic ratios has been intentionally carried out, not only in the leading dimensions, but even in all the details; in this room the ratios selected were 3, 4 and 5. In the main dimensions these have been slightly varied, however, for though the width is 36 feet and the height 48 feet, the length, instead of being 60 feet, has been extended to 90 feet, so that the length has had its first harmonic, *i. e.*, one-half added to it. The result musically is quoted as most successful. A musical friend of mine who had paid considerable attention to this subject, and with whom I have more than once discussed it, very strongly advocates the proportions 1 to 1 to 2 for width, height and length, as representing the ratio of the first harmonic or octave. Personally, I confess to a feeling that if the numbers 3 and 5 are in the ratio, there will be more of the harmonics strengthened, and so greater enrichment of the quality of the tone, for in addition to the fifth of which the ratio is $\frac{3}{2}$, and the third of which the ratio is $\frac{5}{4}$, the fourth of which the ratio is $\frac{4}{3}$, and the sixth of which the ratio is $\frac{5}{3}$ would also seem likely to be assisted, while the simpler harmonic of the octave is likely to be sufficiently in evidence, and, if I may so put it, may be left to take care of itself. From the examples of the Surrey Music-Hall, our University Hall and Professor's Donaldson's room, you will see that height which would be far too great for a building for public speaking seems distinctly favorable to musical effect, and it would further appear from examples that it is better that height should represent the second dimension, and be greater than width. Many cathedrals may be quoted as examples of this, for these buildings, while notoriously

unfavorable for speaking, are almost unrivalled in the musical richness of the support they afford to singing, intoning and instruments. I have been told on good authority that the voicing of many of the English Cathedral organs is extremely coarse, and that their exquisite effects are very largely due to the improvement in quality caused by the buildings. Speaking of *Intoning*, I may here say that the existence of intoning is in itself a verification of the distinction which is the subject of my paper, its origin undoubtedly being due not to anything specially reverent or devout or religious in a monotone (though to hear some people read even family prayers in a small room, you might think there was) but to the fact that while speech could carry but a short distance in such buildings as cathedrals, as soon as the vibrations of the voice were sustained along definite musical notes a reinforcement was obtained and the voice could be heard. As you are aware, our English Cathedrals also were almost invariably set out in dimensions of simple ratios carried through every part, though not for acoustic reasons. It may possibly be argued that surely the intensity of musical sounds cannot be so full in buildings when height is so great, and that in this respect, therefore, there is a loss. This no doubt is true, but to those who prefer quantity to quality in their music, and think they have had most music when they have been most deafened, I have nothing to say beyond commending them to the big drum or a steam organ as among the highest types of musical instrument. Mr. Roger Smith has suggested that the uniform succession of piers and arches in our cathedrals would tend to establish nodal points, and so still further favor musical sounds, and this I think an extremely probable supposition. As regards *reflection* or *echo* in buildings for music, all that has been previously said about this, and about its prevention or correction by curvature, breaks and galleries in connection with buildings for public speaking will equally apply; moreover, what I then said in reference to the space behind a speaker being lower and narrower than the rest of the building will also apply to a singer or an orchestra in buildings for music. As regards *materials* to be employed in the interior of buildings for singing, I need only say exactly the converse of what I said in reference to buildings for public speaking, to which also I would add that a hollow chamber or space especially under an instrument or orchestra should be advantageous in increasing resonance. It was my intention to have added some remarks upon what is to me a matter of special interest, viz., the provision for and position of organs in churches. I refrain, however, as my paper has already so far exceeded its proper length that I feel that I owe you an apology for having trespassed to such an extent upon your patience. My excuse must be the extreme difficulty of dealing with even one part of so problematic and suggestive a subject within the limits of a single paper. In conclusion, I would say that in such a problematic subject I hope I have not appeared to pose at all as a teacher but only as a student open to tuition and correction, and that, while only too conscious of the incompleteness of my paper, I trust that, in spite of its defects, it may deepen the interest you already feel, or awaken a new interest in this department of our profession.

SOME SOUTHERN CAPITOLS.[1] — V.

GEORGIA.



The State-House at Atlanta.

WHEN, in 1886, by his speech on "The New South" before the New England Society, the late Henry W. Grady became suddenly famous, and the *post bellum* prosperity of the Southern States became more generally known throughout the North than ever before, it was the State of Georgia, and more particularly the city of Atlanta, that furnished the inspiration for that speech. And could the speaker have postponed his speech until just before his death, three years later, he might have found further inspiration in the new capitol building in Atlanta, completed early in 1889, which speaks eloquently of a State rising, by her own efforts, from the impoverished conditions in which a most devastating war had left her, to a level with her more fortunate sisters. The history of such a building, however briefly it may have to be told, cannot fail to be interesting.

In *ante bellum* times the capital of Georgia was at Milledgeville, a town laid out for that purpose upon the organization of the State. The name Milledgeville could scarcely be made to grace a poem, and little mention is made of it in history. It appears to have been necessary for the army of General Sherman to go considerably out of its way on the famous "March to the Sea," in order to provide the history of Milledgeville with an event worthy of remark, viz., its total destruction by fire on the 2d of September, 1864, as one of the incidents of war. A detachment of the same army destroyed a far more important city, Atlanta. Upon its blackened ruins rose one of the fairest of Southern cities, and this was in due time made the capital of the State of Georgia. Everything seemed to conspire to make the State and its new capital prosperous, and, in 1883, it was wisely decided that such a prosperous State should have a building of becoming dignity wherein to transact its official business, and a prudent Legislature appropriated the sum of $1,000,000 to cover the entire cost of such a building, to be completed by the 1st of January, 1889. It was expressly stipulated that this sum was to be appropriated out of funds already in the State treasury and available for that purpose, and without increasing the general rate of taxation. The sum was small compared with what other States have expended upon their public buildings, but the published reports of the Capitol Commissioners, now before the present writer, show how wisely this money was expended down to the sum of $118.43, returned to the State treasury at the completion of the work. Out of the amount appropriated were paid the salaries of the commissioners, the supervising and consulting architects, expenses arising from squaring the capitol grounds, and many other items besides the contract price of the building, viz., $862,756.75. It is with pride that the commissioners in their fourth and final report, dated March 20, 1889, claim as the result of their labors a work eminently satisfactory to all who are interested in it, accomplished with economy and without parsimony. The secretary of the commission could not refrain from concluding the brief preface to this final report with these words: "This is the history of one of the best pieces of public work in the United States; a record of honest, conscientious discharge of duty, and the building will stand as a monument to the men who caused it to be erected." The report of the supervising architects, incorporated in this document, calls attention to the facts that "over three-fourths of the material entering into the construction of the building were products of the State of Georgia, and that the labor and artisan work were done principally by home men." They note also that while strikes were going on in other parts of the country while this work was in progress, little or no effect from that cause was experienced about the work of the capitol building. The disposition to congratulale themselves is certainly pardonable in the Georgians, in view of the facts, whether or not they have (to use the words of their commissioners) "more building and a better building for the outlay than any other State can boast of." They went to work in a business-like manner to obtain what they wanted. The act providing for the erection of the building is a model of legislative literature, and the various reports show a faithful carrying out in detail of the provisions of said act.

The act provided that the building should be of granite rock and marble as far as practicable, and that all the materials used in its construction should be procured within the State, provided that the same could be procured as cheaply as other materials of like quality in other localities. It was under this proviso that oolitic limestone from Salem, Indiana, was substituted for granite and marble. This substitution was the cause of an explanatory report of the commissioners to the Legislature showing the various tests made to establish the superiority in cost, beauty, strength, and durability of the oolitic limestone to any of the products of the Georgia quarries.

The design of the building, that of Messrs. Edbrooke & Burnham, of Chicago, was one of ten submitted to the commissioners. It is not of very striking originality. In the mind of the consulting architect it is classic Renaissance, and more academic than the others submitted. In the arrangement of its rooms it differs little from structures of that character generally, its basement being devoted to machinery and storage, the first story to offices, the second to the two legislative halls, the Supreme Court room, and the State library. The third story is for the accommodation of the House and Senate galleries and committee-rooms. The central rotunda, with its corridors, galleries, and stairway, is the most striking feature of the interior, while, of the exterior, the classical portico and the admirably proportioned dome, constructed of stone to the line of curvature of the roof, are the first to arrest the attention. The greatest length of the building from north to south is nearly 350 feet. Its greatest depth is 272 feet. The lantern surmounting the dome reaches a height of 237 feet. As the building occupies an entire block in the heart of the city, it has no grounds about it for the display of landscape gardening. A stranger in Atlanta, upon suddenly confronting this building, would not have to be told its purposes. It emphatically proclaims itself the capitol of a prosperous commonwealth.

ARTHUR HOWARD NOLL.

[1] Continued from No. 879, page 69.

SOCIETIES

BOSTON SOCIETY OF ARCHITECTS.

AT the latest meetings of the Boston Society of Architects and the Boston Architectural Club, the following resolutions of respect were adopted and recorded:

THE Boston Society of Architects desires to record the esteem and sympathetic appreciation which its members long since learned to entertain for the late Eugène Létang. Not only those of its members whose privilege it has been as pupils to enjoy his teachings, guidance and friendship, but also those elder members, who, while not themselves profiting by his instruction, yet appreciated and applauded the great and unqualified success that attended his efforts, feel how much the profession suffers in his loss.

Self-exiled from a more congenial home and career, he unselfishly devoted himself for twenty years to promoting in the minds of those who fell under his care a sound conception of the real principles that underlie the art which he so sincerely loved and understood so thoroughly, and to whose interests he finally sacrificed his life.

BOSTON ARCHITECTURAL CLUB.

IN the death of Professor Eugène Létang, of the Massachusetts Institute of Technology, the Club has suffered a loss which, to many of its members, is a personal one.

Not only do many of us look back with respect and affection to our intercourse with him as one of our instructors in architecture at the Institute in years whose profit was largely due to his knowledge and devotion, but many never connected with the Institute of Technology have learned, in the classes which he conducted in this Club, to value him for his own sake as well as for the technical knowledge he could so well impart. Therefore be it

Resolved, That the Architectural Club of Boston hereby expresses its sense of the great loss which (in common with the profession at large) it has suffered in the death of Professor Létang, and that we hereby tender our heartfelt sympathy to Madame Létang in her bereavement.

Resolved, That a copy of this Preamble and these Resolutions be sent to Madame Létang.

NATIONAL ACADEMY OF DESIGN, 1893. — SIXTY-EIGHTH ANNUAL EXHIBITION.

THE Sixty-eighth Annual Exhibition of the National Academy of Design will be opened to the public on Monday, March 27, and will close on Saturday, May 13.

Works will be received from Thursday, March 2, to Saturday, March 4, inclusive, after which time no work will be admitted.

Lists must be sent to the Superintendent before Saturday, February 25.

Varnishing Day, Thursday, March 23, from 9 A. M. to 5 P. M.; and from 7.30 to 10 P. M., Academicians, Associates and Exhibitors will be admitted, and *no other person*, excepting the Press (by card) after 12 o'clock M.

The only exhibits eligible are original works in oil, pastel or sculpture, by living artists, and which have never before been publicly exhibited in the City of New York or Brooklyn.

All works received at owner's risk.

Rejected works not removed from the Academy within *one week* after the opening of the Exhibition, and accepted works not removed within *one week* after the close, will be stored at the risk and cost of the owners.

No accepted work can be withdrawn before the close of the Exhibition, and all works must remain as placed by the hanging-committee.

Glass on oil paintings will not be admitted, and not more than *three* works by any one artist will be exhibited.

A competent person will attend to sales upon which a commission of ten per cent will be charged. Prices should be stated on the list when sent in, and will be inserted in the catalogue, unless otherwise directed.

The Academy does not collect or return exhibits. They must be sent in and afterwards removed by the exhibitor himself, or his agent, within the specified dates. No packing-boxes will be received.

Works offered for exhibition by dealers must be accompanied by the artist's written consent thereto.

All contributions will be subject to the judgment of the following

JURY OF SELECTION.

J. G. BROWN,	GEORGE H. MCCORD,
F. S. CHURCH,	LOUIS MOELLER,
CHARLES C. CURRAN,	C. S. REINHART,
THOMAS W. DEWING,	AUGUSTUS ST. GAUDENS,
GILBERT GAUL,	R. M. SHURTLEFF,
S. J. GUY,	D. W. TRYON,
JAMES M. HART,	C. Y. TURNER,
EASTMAN JOHNSON,	EDGAR M. WARD,
H. BOLTON JONES,	IRVING R. WILES,
WILL. H. LOW,	J. H. WITT.

HANGING COMMITTEE.

J. G. BROWN, KRUSEMAN VAN ELTEN, IRVING R. WILES.

PRIZES TO BE AWARDED AT THE ANNUAL EXHIBITIONS OF THE ACADEMY.

The Thomas B. Clarke Prize, $300. — For the best American Figure Composition painted in the United States by an American citizen, without limitation of age.

The Julius Hallgarten Prizes, $300, $200 and $100. — For the three best pictures in oil colors painted in the United States by American citizens under thirty-five years of age.

The Norman W. Dodge Prize, $300. — For the best picture painted in the United States by a *woman*, without limitation of age.

TIME, PLACE AND METHODS OF AWARDING THE PRIZES.

The method of awarding the Hallgarten Prizes will be announced later.

The Academicians will not compete for any of the prizes.

The Thomas B. Clarke and the Norman W. Dodge prizes will be awarded by a Committee of three Academicians and two Associates of the Academy, who may receive the highest number of votes cast by the exhibitors. A blank form for this purpose will be sent to each exhibitor to be filled up and duly returned to the Secretary.

By order of the Council,
J. C. NICOLL, *Corresponding Secretary.*
THOMAS W. WOOD, *President.*

THE ILLUSTRATIONS

[*Contributors are requested to send with their drawings full and adequate descriptions of the buildings, including a statement of cost.*]

THE WEST END PRESBYTERIAN CHURCH, CORNER AMSTERDAM AVENUE AND 105TH STREET, NEW YORK, N. Y. MR. HENRY F. KILBURN, ARCHITECT, NEW YORK, N. Y.

[Gelatine Print issued with the International and Imperial Editions only.]

THIS church, built of buff brick, relieved with terra-cotta of slightly lighter tone, is a very good example of rapid building as it is now carried on in this country, the corner-stone having been laid June 22, 1891. While the church proper was building, the society worshipped in the chapel annexed to the present structure designed in a similar style but by other architects.

THE INTERNATIONAL TRUST COMPANY'S BUILDING, DEVONSHIRE ST., BOSTON, MASS. MR. W. G. PRESTON, ARCHITECT, BOSTON, MASS.

STUDIO BUILDING, ST. LOUIS, MO. MESSRS. EAMES & YOUNG, ARCHITECTS, ST. LOUIS, MO.

HOUSE OF S. TAYLOR, ESQ., WINTERS, CAL. MESSRS. PERRY & HAMILTON, ARCHITECTS, SAN FRANCISCO, CAL.

THE house is situated in a valley, which becomes excessively warm during the summer months, and was designed to make and have a continual circulation of air through the whole house, this being accomplished through the central court. The court has glass sides above the roof but is boarded over, and provided with hammocks on the top deck, to be used during the warm weather for sleeping. The entire house is plastered on the exterior from top to bottom, and is designed in the old Spanish or Mexican style prevalent in California in very early days. The inside finish of the house is made from walnut and other hard woods, and red-wood grown on the place.

OLD COLONIAL DOORWAY, ALBANY, N. Y. MEASURED AND DRAWN BY MR. G. F. CRUMP, ALBANY, N. Y.

TOWN HOUSE FOR MR. —— MR. B. F. WILLIS, ARCHITECT, YORK, PA.

HOUSE OF CROSBY S. NOYES, ESQ., SILVER SPRING, MD. MR. W. J. MARSH, ARCHITECT, WASHINGTON, D. C.

[Additional Illustrations in the International Edition.]

CHURCH ON CAPITOL AVE., OMAHA, NEB. MESSRS. WALKER & KIMBALL, ARCHITECTS, BOSTON, MASS.

[Aquareltype.]

PORCH OF THE WEST END PRESBYTERIAN CHURCH, NEW YORK, N. Y. MR. HENRY F. KILBURN, ARCHITECT, NEW YORK, N. Y.

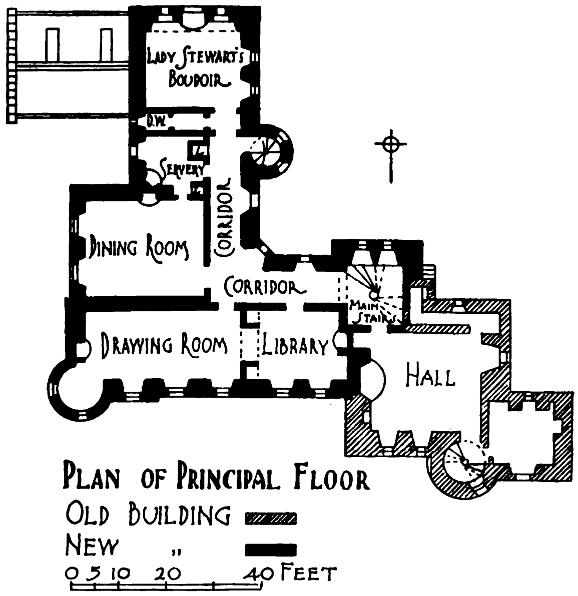
[Gelatine Print.]

ENTRANCE TO THE CHAPEL OF THE WEST END PRESBYTERIAN CHURCH, 105TH ST., NEW YORK, N. Y. MESSRS. CARRÈRE & HASTINGS, ARCHITECTS, NEW YORK, N. Y.

[Gelatine Print.]

GRANTULLY CASTLE.

ON October 22 we published a reproduction of the drawing by Mr. Leadbetter, which appeared in the last exhibition of the Royal Academy. We now give, according to promise, the companion view, showing the castle from the southwest. It will be seen from



the plan that the additions are extensive, and they have been arranged "so as to provide the necessary accommodation for a modern country house, while at the same time retaining the spirit of design of the old building, and keeping the modern additions as subservient as possible to the original building." A description of the additions will be found on page 62, Vol. XXXVIII.

CAPITAL IN NAVE OF THE CATHEDRAL, MONREALE, SICILY. DRAWN BY MR. J. A. SLATER.

AMBO IN THE CATHEDRAL RAVELLO. DRAWN BY MR. J. A. SLATER.

KNAITH CHURCH RESTORATION.

COMMUNICATIONS

[*The editors cannot pay attention to demands of correspondents who forget to give their names and addresses as guaranty of good faith; nor do they hold themselves responsible for opinions expressed by their correspondents.*]

GRAPHIC ANALYSIS OF A ROOF TRUSS.

SALT LAKE CITY, December 26, 1892.

TO THE EDITORS OF THE AMERICAN ARCHITECT:—

Dear Sirs,—I enclose strain-sheet of truss, in answer to "A Reader," in your issue of December 17.

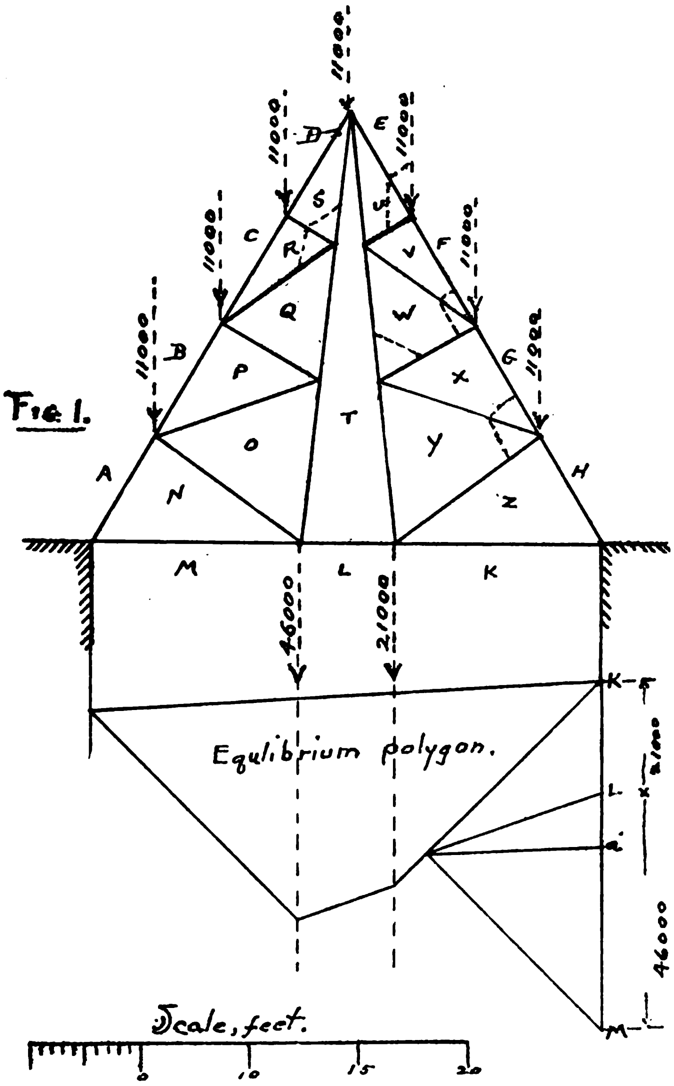
Figure 1 shows the truss with its loads, in round numbers, omitting the two loads of 5,552 pounds; as they do not affect the strains, and may be neglected, further than to proportion the bays of each rafter to carry a uniform load of 11,104, in addition to the strains indicated by the diagram of strains, Figure 2.

This is with the supposition that the rafters of the roof rest on the truss.

The unsymmetrical loading below necessitates an equilibrium polygon to obtain the reactions at the supports. This being put on the load line (Fig. 2) with the points a' coinciding enables us to measure the total reaction at once on the load-line, and also the total strain on each truss member in the diagram. It is evident, I think, that $U\,V$, $W\,X$ and $Y\,Z$ are in compression, and $V\,W$ and $X\,Y$ in tension.

The only strain in $U\,V$ arises from the load $E\,F$ and equals, as is found by drawing a parallelogram, 6,000 pounds. This creates a strain in $T\,U$ and $V\,W$; the latter, which only concerns us now, is found to be 7,000 pounds and strains $W\,X$ to the extent of 2,000 and $G\,X$ in an amount that will be included in the total, which will be shown by the diagram. To the strain in $W\,X$, 2,000 pounds must be added, that arising from the load $F\,G$, 6,000 pounds; making 8,000, which creates an 8,000-pound pull in $X\,Y$, and is reduced to 6,000 by the time it reaches $Y\,Z$. Here it is augmented by 6,000 from the load $G\,L$, making 12,000 pounds total strain in $Y\,Z$ and the same in $N\,O$. Draw now, in Figure 2, $H\,Z$ and $A\,N$ parallel respectively to those members of the truss, until they meet horizontals from M and K. From Z and N draw $Z\,Y$ and $N\,O$ respectively parallel to those members, and equal to 12,000. The remainder of the diagram is easily drawn, and will close if drawn accurately. The larger the drawing the more accurate will be the

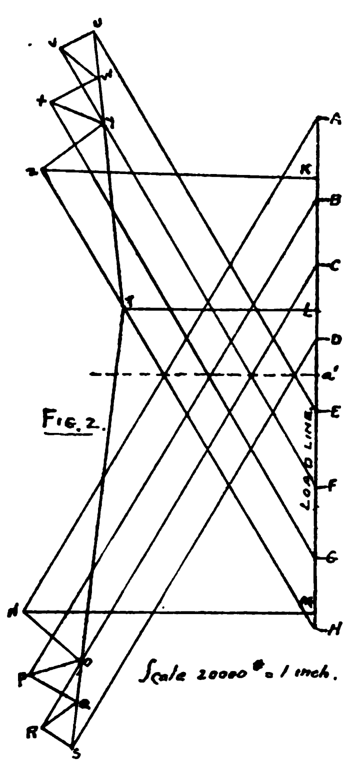
Fig. 1.



Strains

AN	=	87000	Compression
BP	=	84000	"
CR	=	81000	"
DS	=	72000	"
EU	=	66000	"
FV	=	77000	"
GX	=	80000	"
HZ	=	80000	"
KZ	=	41000	Tension.
LT	=	29000	"
MN	=	44000	"
NO	=	12000	Comp
OT	=	53000	Ten.
OP	=	8000	"
PQ	=	8000	Comp.
QT	=	60000	Ten.
QR	=	7000	"
RS	=	6000	Comp.
ST	=	67000	Ten.
TU	=	42000	"
UV	=	6000	Comp
VW	=	7000	Ten.
WT	=	35000	"
WX	=	8000	Comp
XY	=	8000	Ten.
YT	=	28000	"
YZ	=	12000	Comp

Fig. 2.



amount of the strains. I have been puzzled several times in similar cases and the above is the only way I have found to get around them. Hoping I have answered "A Reader," or that somebody else will do so and tell me where I am wrong, I remain,

Yours very truly, EZRA M. CORNELL.

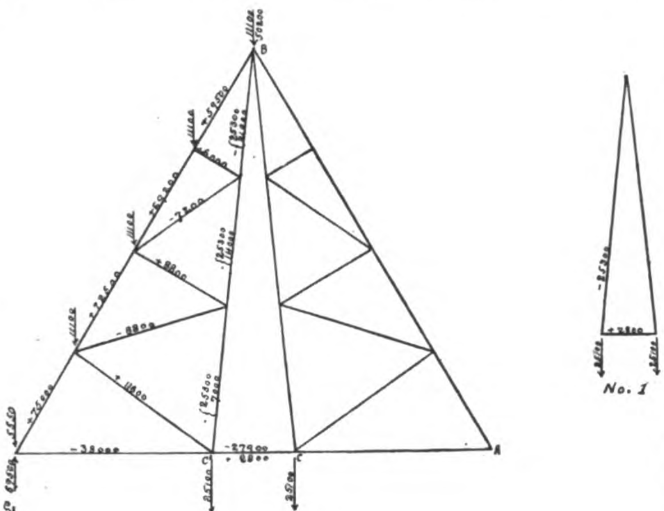
INDIANAPOLIS, IND., December 24, 1892.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

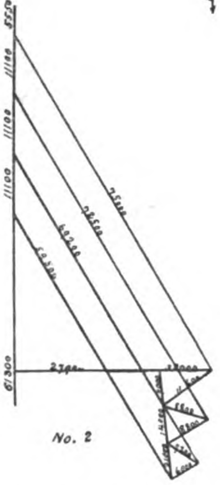
Dear Sirs, — Enclosed you will find graphical solution of truss problem, submitted by "Reader," page 188.

Like most students, "Reader" has discovered that the authors and college professors only tackle the easy problems.

One of the main points in any truss is to determine the points of application of the various loads. Diagram No. 1 shows that the



No. 1



No. 2

point of application of the two-centre suspended loads is not at C and C' but at B; $\overline{CB}$ and $\overline{C'B}$ acting not only as parts of the general truss system, but also as ties transmitting the loads C and C' to B.

Another difficulty occurs at points C and C', as four members meet at these points.

The Fink truss on account of its symmetry allows a solution of the polygon of four forces; in all other cases one of the stresses has to be computed.

Taking moments about B of the forces to the left, we have

$$\frac{69500^{\#} \times 23' - [11100^{\#} \times (5\tfrac{3}{4} + 11\tfrac{1}{2} + 17\tfrac{1}{4}) + 5550 \times 23]}{39} = 27,900 = \text{stress}$$

in $\overline{CC'}$, from which the diagram is extended as in No. 2; half of diagram only being shown.

Owing to the small scale, the stresses given are approximate.

Very respectfully, F. A. SHERRILL.

NOTES AND CLIPPINGS

NATURAL SCENERY AND ADVERTISEMENTS. — The desecration of public buildings and of natural scenery by the barbaric advertiser of daily commodities and quack nostrums is a growing evil the whole world over, and is perhaps more generally prevalent in England than anywhere else. It has penetrated to the remotest corners of that nation of shop-keepers, and is to be met with alike in the Thames Valley, the passes of North Wales, and the loveliest spots of Devonshire. Some "signs" of more than common atrocity recently moved Mr. A. Waterhouse, the Royal Academician, to write a letter of complaint and protest to the *Times*, in which he suggested that such disfigurements ought to be heavily taxed. Mr. Waterhouse's broadside has been followed by another from two other artists, W. B. Richmond and Heywood Sumner, who brought the matter to the public attention two years ago. They make the following suggestions: "We would urge that the method now partly adopted by one firm for posting announcements relating to entertainments, publications, sales, etc., should be made universal and compulsory in its application to all casual street advertisement. The method consists in the division of a large board into numerous spaces by means of narrow strips of moulding intersecting each other at right angles. Each space thus enclosed is large enough to contain a double-crown poster sheet — *i. e.*, 20 inches by 30 inches — while an inscription is placed at the top of the board stating the subject of the announcements which may be placed thereon — entertainments, publications, sales, or what not. Such universal restriction as to size and subject matter would give a prevailng sense of order to the setting forth of the varied schemes of men, and would put an end to the present reckless appeals of the incontinent advertisers." — *N. Y. Evening Post.*

THE SEWERAGE OF LEVEL TOWNS. — In reply to a question asked by the Indian Association in reference to the drainage of towns in the plains of India, Mr. B. R. Harrington remarks, that as the physical conditions of all such towns are nearly identical, the same general principles will apply to all. For such towns Mr. Harrington recommends the laying of an hydraulic main from four inches to six inches in diameter, laid about two feet below the street level, connected to a steam-pump capable of forcing water through it at a velocity of two feet a second, and discharging it at a sewage-farm some two or three miles away from the town. At convenient situations along the line night-soil receptacles should be placed. The contents of these receptacles should either flow into the pipe automatically or be forced into it by means of a force-pump. The latter plan must be adopted when the pressure in the main never falls below that of a head corresponding to the level of the night-soil receiver. For larger towns, and especially for those having a public water-supply, nine-inch gravitation drains laid at a slope of one in three hundred should be used. The sewage would flow through these to a pump-well, whence it would be forced to the sewage-farm outside the town. — *Engineering.*

TRADE SURVEYS

THE most encouraging feature in recently-published financial statements is that a larger volume of stocks are now paying remunerative dividends than at any time in our history. The percentage of non-paying securities and investments has been declining for over a year. The number of railroads that have gone into receiverships has also declined. The listing of securities on the Stock Exchange shows what an expansion of business there is in progress. All of the features shown in the financial reports are of an encouraging nature. There is, of course, a large amount of non-paying stock afloat, and there are hundreds of millions of stocks seeking listing privileges which will remain non-paying for a long time to come; but it is safe to say that the greatest care will be taken and scrutiny maintained in the accepting of any new securities. The tendency is to deal as nearly as possible on a cash basis. Ten to twenty years ago, a great many new enterprises were projected on paper and maintained on credit. Fewer ventures of this kind are now being made. Another favorable point is that nearly all of the new enterprises are promoted by existing corporations, or companies well backed by capital or credit. The importance of this condition of things is greater than is apparent on the surface; it shows and proves that the basis of business is stronger, and that the possibilities of reaction or depression, or financial panic, have been greatly reduced. It is difficult to see in the future any causes likely to interrupt this favorable condition of things. We are gaining in strength every year; the fact has been frequently pointed out that there is a healthy and steady decentralization going on, especially in the industries: this fact cannot be commented on too favorably or too strongly. There is no "manufacturing East" or "wheat-growing West" — not, at least, in the sense of five or ten years ago. Coal is being found scattered all over the country; oil is being produced in unexpected quarters; natural gas is being found in localities where the possibility of its existence was denied by experts a few years since, and these three potent factors are serving to stimulate industrial activity in many new sections. Small manufacturing plants are springing up, since it is now possible to save freight on long hauls. There is not now that dependence upon great Eastern manufacturing centres that there was a few years ago. All sorts of iron and steel using factories and shops are springing up in far-off Western and Southern sections; hardware establishments, hosiery and textile mills are numerous. Paper-mills are now strongly established throughout the far West, making fine grades of paper, and making money. This tendency is likely to expand, and to employ a vast amount of capital, and the effects of it will be to harmonize and equalize and strengthen our industrial system, and to develop it in a way and to an extent which would be impossible in any other country on the globe. The year opens with active markets in nearly all staple products. There seems to be a feeling among consumers that higher prices may possibly prevail, and the feeling is just strong enough to induce manufacturers to make liberal purchases on forward account. At the same time, they recognize the fact that there is an enormous producing-capacity everywhere. The monetary situation has not changed. The exportation of gold seems to have no visible effect. The doctors of finance disagree upon fundamental questions. The agitation against the greater use of silver is continued, and is assuming organized form. The contest will be fierce and bitter. The people of the far West are determined to have their way; the well-organized interests of the East are quite as bitter and determined on the other side. But little need be looked for from foreign conferences on monetary questions; selfish interests will probably dictate the course pursued. As regards the probabilities for the opening year, much that is said on the subject is, of course, merely guess-work; much is of that hopeful kind of talk so easily spoken and written. But all of the great changes, upward and downward, of the past twenty years have been sudden and unexpected. There is nothing more difficult to see into than the future conditions of trade and commerce. Panics come unannounced, like a thief in the night. The only safe and reasonable statement that can be made is that the country is strong, the industries busily engaged, profits sufficient to protect business against bankruptcy, and credit safe. The financial machinery of the country was never in better trim for the quick exchange of commodities and their values. In fact, the machinery of business was never more perfect, and the comprehension of what is required was never clearer. The business men, manufacturers, bankers, railroad managers all understand the problem before them — know how much to make, how far to go in competition, and when and where to stop.

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CONTENTS

SUMMARY: —

Mr. G. W. Vanderbilt's Gift to the American Fine Arts Society. — Attitude of Massachusetts State-house Extension Commissioners towards the Old State-house. — A New Jersey School-house Competition and its probable Outcome. — Methods of Cleansing Papers and Fabrics. — An Enterprising Russian Insurance Agent. — Victims of the Trolley in Boston. 17

ARCHITECT, OWNER AND BUILDER BEFORE THE LAW. — XXVII. 19

DAYLIGHT IN THE DWELLING-HOUSE. 21

MODERN MOSAIC. 23

THE EVOLUTION OF THE MODERN FIREPLACE. 25

COMPARATIVE MUNICIPAL BUILDING LAWS. — XX. 26

NOTES ON THE WEIGHT OF CROWDS. 26

EFFECT OF A FIRE ON A CHICAGO BUILDING OF FIREPROOF CONSTRUCTION. 27

UNPROFESSIONAL PRACTICES. 28

SOCIETIES. 29

ILLUSTRATIONS: —

House of Mrs. J. C. Coonley, Division Street and Lake Shore Drive, Chicago, Ill. — Competitive Design for the Manhattan Life Insurance Building, New York, N. Y. — Competitive Design for the Bank of Commerce Building, Buffalo, N. Y. — Market and Armory, Portsmouth, Va. — Proposed National Guard Armory, San Francisco, Cal. — Armory for the Savannah Volunteer Guards, Savannah, Ga. — Presbyterian Church, Mansfield, Pa.

Additional: Tomb of August Belmont, Newport, R. I. — Rear View of the Same. — Tomb of Ann Maria Smith, Newport, R. I. — Fox Oak, Burhill, near Weybridge, Eng. — Church of S. Maria di Castello, Corneto. — A Church at Corneto. — Summer Residence at Point Lonsdale. — Design for Villas, Mount Martha Estate. 30

COMMUNICATIONS: —

The Saltpetering of Brickwork. — A Disputed Commission. — The Late Adrian Worthington Smith. — Defective Flues. 31

NOTES AND CLIPPINGS. 31

TRADE SURVEYS. 32

ONE of the most notable events last week is certainly the announcement of the gift, from Mr. George W. Vanderbilt, to the American Fine Arts Society, of one hundred thousand dollars, or, rather, of a deed of the gallery building adjoining and connected with the Society's building, which has cost that sum. Hardly less gratifying, and, in a certain sense, more useful, is the kindness with which Mr. Vanderbilt has, from the first, encouraged the undertaking of a society whose resources bore a very small proportion to its zeal, and which finds itself now, thanks to the generosity of the friends whom that very zeal has called around it, in possession of a building more spacious and well-equipped than its wildest dreams pictured to it at the outset, burdened with a debt which, although difficult enough for artists and poor students to carry, is yet small in comparison with the value of the property, and is likely to be lightened by assistance from outside as the great work of the Society becomes more widely known. In the extension of the reputation and usefulness of the Society, Mr. Vanderbilt's gift will have a most important part. The Art-Students' League, the Architectural League, and the Society of American Artists might each have existed by itself, might have held exhibitions, and provided for the instruction of its members; but the splendid exhibition-gallery, which forms the principal portion of Mr. Vanderbilt's building, will form a central point of fusion between them, which will be of great mutual benefit. In fact, the Fine Arts Society owes its existence to the conviction that the arts of form and color could not live happily separated, and the family which it has now succeeded in creating would have failed of much of its domestic bliss without this common meeting-place. Already, the gallery is engaged for various loan and other exhibitions, in which all the divisions of the Society participate, and every occasion on which the divisions of the Society meet each other and the public in their common parlor helps the public, the Society, and the professions which constitute the Society, to better understanding and higher regard.

THE Commissioners who have in charge the construction of the extension which may be seen, by the visitor to Boston, hiding coyly behind the Massachusetts State House, have come, according to their report, which has just been presented to the Legislature, to an extraordinary conclusion. It will be remembered that a couple of years ago, when the matter of increasing the accommodation in the State House was under discussion, we were so unfortunate as to incur some obloquy on account of our incautious suggestion that it might be possible to do away with the present State House. In fact, if we recollect rightly, we were so irreverent as to observe that the present State House consisted mainly of a wooden dome, badly rotted, and covered with a tin roof, which, as it was in constant danger from fire, and would fall down from decay before long any way, might be dispensed with, and the site, one of the most splendid in the United States, covered with a structure, arranged, perhaps, in some such way as the Palais de Justice at Brussels, or the Propylæa group at Athens, which would give ample accommodation for the State offices, in one of the noblest architectural compositions ever devised. For this audacious suggestion we received nothing but rebuke. We were informed that, although the present dome was leaky and rotten, it enclosed a wealth of sentiment and reminiscence which none but a Vandal would dream of laying his sacrilegious hands upon. By another critic we were told that the present façade of the State House, the dome included, was a work of such mysterious, but supreme loveliness that there was no possibility that any modern work could present equal interest, and that it was far better to let its tin rust off, and its spruce boards moulder gently into dust, than to try to replace it by anything else.

AS we, like most of our nearer relatives, were born in or near the shadow of the State House, and our boyish experience as a volunteer assistant in Governor Andrew's office during one of the most exciting periods of the Civil War had given us at least a notion of some of the reminiscences attached to the building, we could only account for our insensitiveness to the impropriety of our proposal by supposing it to be due to a natural brutishness of instinct, over which it would be well to cast a veil, and we forbore to discuss the subject further. Meanwhile, the Legislature, in deference to those exalted sentiments with which we had failed so painfully to sympathize, purchased, at great expense, a tract of land across the street in the rear of the sacred building, and there proceeded to erect an immense tail-piece, connected with the original structure by an iron bridge, but, as far as possible, concealed behind it. This tail-piece, which is of somewhat different material and style from the State House itself, is already approaching completion. Now, however, a strange phenomenon is to be observed. After a sacrifice by the State of millions of dollars, to say nothing of artistic effect and convenience of arrangement, for the sole object of keeping the ancient State House intact, we find the Commissioners of Construction of the new extension saying to the Legislature that "They feel it their duty to suggest whether the whole State House should not be made new. When the extension already authorized is completed, practically nothing of the old part will be left except Doric Hall, with its wings, halls, and the dome above it. It is some hundred years old. *Its outer walls and wooden finish will not be in keeping with what, though called the addition, will really be five-sixths of the whole building.* The dome is of wood, subject to the impairment of age, and should be iron. It is hardly possible that many years will pass, in any event, before this old and most conspicuous part, facing Beacon Street and the Common, will be made of equal quality with the rest. If so, it is to be considered whether the renovation cannot be made better and cheaper now, in conjunction with the work of the extension, than hereafter as a new enterprise." We must confess that on first reading this part of the Commissioner's report, after our astonishment had a little subsided, the old beast-like instinct rose up in us once more, and whispered, "Would it not have been better and cheaper still, instead of now making over the head to match the new tail, to have renovated the head, if necessary, first, and added the tail afterwards?"

A CORRESPONDENT sends us an advertisement of a competition for a public school building in a New Jersey town, adding some comments of his own as to his experience of the way in which such competitions are usually carried out. When we say that the programme requires competitors to furnish quarter-scale drawings, full specifications, and a "bonifide" estimate, by a responsible contractor, for the erection of the building complete, our older readers will need no information as to the probable future history of the affair; but the public, which occasionally wonders that architects of reputation in the profession never have anything to do with public school-houses, and educated teachers, who must sometimes think it strange that the planning of American school-houses almost never shows the faintest knowledge of the principles of school-planning which are accepted in all other civilized countries, may derive a new light from the suggestion that architects who possess any skill in their profession never throw away six hundred dollars' worth of work in the hope of securing a one-thousand-dollar commission, that such men usually understand too well the value of their own work to intrust the decision in regard to its merit to any but experts in whom they have confidence, and that, as experience has shown, by an overwhelming array of scandals, honest architects had better give public work a wide berth, such advertisements or circulars as the one sent us are, in most offices, thrown into the waste-basket without reading.

THAT there will be responses to such an invitation we do not, of course, deny. In such cases, it often happens that one of the committee, or board, has a *protégé*, in the shape of a draughtsman or engineer's clerk, or builder with some knowledge of drawing, who has been kept informed of the wishes of the board, and who, it need not be said, will be vigorously pushed for employment by his patron, even if, indeed, he is not already the choice of the board, who have instituted the "competition" for effect on the public, and to "get some other architects' ideas" for the benefit of their favorite. Besides competitors of this kind, plans will often be offered by builders' clerks, or by a builder himself, in the name of one of the nondescripts who make elevations for contractors, with, of course, the intention of throwing the contract for the erection of the structure into the hands of the builder, who can easily afford, out of his twenty-five or thirty per cent profit, to pay his servant for his work wages suited to his necessities. Where the importance of the projected building is sufficient to attract larger and more ravenous beasts of prey, the professional "public-building architect" may put in an appearance. This personage, although celebrated in the newspapers, and in the councils of politicians and legislators, is so little known to architects and the public generally that his portrait would hardly be recognized; so it will be sufficient to say that he is the man who bribes servants to commend his plans to the dignitaries by whom they are to be judged; who contrives that his buildings shall cost twice what they could be honestly built for; who levies blackmail on contractors, to be reimbursed, of course, out of the building funds, to the extent of many times the fees which would be paid to a skilful and honest architect; and who solaces himself for his condescension in doing nominally an architect's work at half an architect's charge by the rewards incident to conniving at the erection, by the contractors, of a mean, tottering sham, at a cost which would be extravagant for such solid construction and skilful plan as a true architect would secure.

IT is worth while to remember the principal methods of removing spots from paper, or other fabrics, which are summed up as follows in the *Wurtemberg Gewerbeblatt:* In general, the best solvent for spots, particularly those of unknown origin, is chloroform. Grease, pitch, tar, and wax are all dissolved by this substance, which has the additional advantage of evaporating very rapidly and completely, so that, if the place to be cleaned is first saturated with the chloroform, and then rubbed with clean cloths, the spot can generally be removed without leaving the sign, in the shape of a discolored border, which usually attends the use of other solvents. Spots of ordinary ink, or of any other compound of iron and tannic or gallic acid, resist chloroform or benzine, but are easily removed with an aqueous solution of oxalic acid, which should be applied hot, if possible, but not too strong. Stains of organic substances on white paper or cl th can often be removed by a solution of peroxide of hydrogen. This will bleach colored fabrics, but does not injure white ones in the least, and is powerful enough to remove mildew stains from both paper and cloth. Next to these substances, benzine is probably the most useful detergent, as it is the best known. This can be used where the color of the material to be cleaned would be injured even by chloroform, and its action can be made still more gentle, where the fabric is very delicate, by mixing it with calcined magnesia into a paste, and spreading the paste on the spot, renewing it at intervals, as the benzine evaporates. The foreign body, as it is dissolved by the benzine, is absorbed by the magnesia powder, and at the conclusion of the operation the magnesia can easily be shaken off.

WE doubt if Chicago itself could furnish a more shining example of business enterprise than was recently to be observed, according to the German papers, in a small town of Russian Lithuania. In this town there lived, at one time, three insurance agents. There was not enough business for one, and two of the three became at length discouraged, and departed, leaving the field to the third, who appears to be a man of genius. Soon after the other two agents were safely out of the way mysterious placards were posted at night on the houses of the principal inhabitants announcing that before long, the whole town would be destroyed by a conflagration. Naturally, in view of this warning, those of the inhabitants who had not insured their houses made haste to do so, while those who were already insured increased their policies, so that the only agent in the place did a roaring business, at his own rates. Unfortunately, however, for him, some rival, or other suspicious person, hearing of the circumstances, set detectives to make an investigation, which resulted in the discovery that the ingenious agent had pasted up the placards himself. What was done to him to curb his enterprising spirit for the future we are not informed, but it is probable that the competing insurance agents took care to have him made an example of.

ONE often has to go from home to learn what is actually occurring there, and it is with gratitude that we, who entertain strong feelings on the trolley nuisance, discover in the New York *Evening Post* facts concerning the operations of the trolley in Boston which, we believe, have never been stated in the Boston newspapers, which maintain upon this head such an extraordinary silence. What amount of fire-loss should actually be charged to the trolley feed-wires, there is no means of determining, and so we cannot comment upon the matter, which, as architects, most properly concerns us. But the rights of common citizenship have a higher claim to attention, and, as we believe the owners of the trolley franchise and system in Boston consider everything before the private rights of citizens, we are glad to do what we can to draw attention to the manner in which the highest right, the right to live, suffers at the hands of these monopolists. From the sworn returns made to the Railway Commissioners, it appears that in the year 1892 there were killed by the cars of the West End Street Railway Company twenty-one persons, while two hundred and ninety others were injured, and we feel certain that the public press of Boston did not give to these three hundred casualties the publicity that such mishaps should have received. This death-loss is an increase of four hundred per cent over fatalities occasioned by the road during the year before the introduction of the electric-car; while the increase in the number of persons injured, as compared with the year 1888, is eighty-three per cent. The fatalities exceed the average number of those which have occurred during the past ten years at the twenty-two hundred grade-crossings in Massachusetts. Money is a poor return for a lost life, and, while the $206,475 paid in 1892 (an increase over 1888 of $167,817) as damages for this appalling number of casualties — while there are still many suits pending in the courts — are in some degree a compensation, yet this use of income can hardly be relished by the stockholders of a corporation whose accounts, but for certain extraneous and unusual accessions to income, would show, it is said, a deficit for the year just closed. Of all places in the country, Boston is the one where the trolley-car should have no place, although the system is installed there with admirable completeness, and the motor-men handle their huge death-dealing machines with wonderful skill and promptitude. The surface trolley-car and its overhead live wire *ought* to go.

ARCHITECT, OWNER & BUILDER BEFORE THE LAW.[1]—XXVII.

Window-head, Eighteenth Century, French.—From *L'Art pour Tous.*

IN another case,[2] where the amount of the contract price is not stated, the referee found that the contract had been substantially performed, but that $150 should be deducted from the contract price as recoupment to the owner for work defectively and insufficiently performed. The owner appealed, claiming that the amount of recoupment allowed by the referee showed that the contract had not been substantially performed; but the Court of Appeals held that "the amount allowed was "not such as to show that the finding of substantial perform-"ance was unsustained by evidence."

In another New York case,[3] the contractor for a house omitted to put cornices and centres as specified in some of the rooms, and left out the hair from the deafening mortar; and one of the stone lintels was imperfect; but the referee found that the contract had been substantially performed, and his decision was sustained.

In another instance,[4] there were defects to the value of $200 in certain plastering, the whole amount of the contract being $11,700. The architect refused, on account of the defects, to give a final certificate, but the referee found that the contract had been substantially performed, and that the contract price should be paid, deducting $200 for the defects. The fact that the architect's certificate was not produced, as required by the contract, the referee accounted for by finding that it had been unreasonably and improperly refused. The Court of Appeals sustained the decision of the referee, both as to the substantial performance of the contract and the right of the plaintiff to recover without the certificate of the architect, saying that "an unreasonable refusal on the part of the architect in such "a case to give the certificate dispenses with its necessity."

On the other hand,[5] where a man in New York agreed to strip the earth from a certain area of quarry land, and abandoned the job, leaving a strip from three to five feet wide unfinished, and when the owner asked him to come back and complete his work refused to do so, it was held that, the work having been intentionally left unperformed in a substantial particular, he could recover nothing for what he had done; and where a contract[6] had been made to construct a building in a good, substantial and workmanlike manner, for a certain price, to be paid on the completion of the building, but the contractor built it so unskilfully that the walls were unsafe, and could not be made safe without rebuilding a considerable portion, estimated at two-fifths of the whole, and the owner refused to accept the work, it was held that the contractor could recover nothing.

In Minnesota,[7] one Bixby agreed with Williamson to build a brick party-wall along the line between them, one-half to be on land of each; the cellar wall to be of stone, and the wall above to be of brick, 70 feet long, 28 feet high and 12 inches thick. The price was to be paid when the wall was completed. Bixby built the wall as agreed, except that at the front of the wall, above the basement, he put a stone pilaster 13 feet high, 16 inches wide and 10 inches deep. Williamson refused to pay for the wall, on the ground that it had not been built as agreed; and was sustained by the Supreme Court, which held that the building of the wall in this manner was not a compliance with the contract, so that Bixby could recover the price.

This seems like a rather hard case, especially as Bixby appears to have been equally interested with Williamson in the wall, and to have put the pilaster in front as a portion of a stone façade which he expected to join with Williamson in building at some future time; but all Courts, even where the milder theory of the law prevails, are disposed to look with disfavor on intentional variations from the agreement; and in another Minnesota case[8] it was held that "The doctrine of "substantial compliance with building contracts does not apply "when the omissions or departures from the contract are "intentional, and so substantial as not to be capable of remedy, "and that an allowance out of the contract price would not "give the owner essentially what he contracted for." In this case, the builder, by fraudulent collusion with the superintendent, cheapened the building by omissions of work contracted for. The Court held that there could be no recovery, either for whole or part performance, although the owner had taken possession and was occupying the building.

In Kansas,[9] as in Minnesota, the stricter view appears to be held. A man contracted to put down 2″ x 6″ sills for a sidewalk. He actually put down 2″ x 4″ sills of pine. In a suit to recover the value of what he had done, on *quantum meruit*, the Supreme Court held that he could recover nothing.

In Michigan,[10] the law appears to be in a rather uncertain condition. A builder in that State made a contract for the erection of a church. In the course of the work he made the following changes from the plans and specification: 1. Instead of fifteen windows, he put in only thirteen. 2. Instead of one-and-one-half-inch flooring, he used one-and-one-fourth-inch. 3. Instead of two-inch doors, he put in doors one and three-fourths inches thick. 4. Instead of four posts under the gallery, he put two. 5. Instead of three-by-eight studding throughout, he used some two-by-eight studs.

There was some reason to suppose that the change in the number of windows was agreed to by the church authorities; but no order was given for the other changes. When the building was done, the church authorities refused to accept or pay for it. The contractor sued for the contract price, less the cost of making good the deficiencies, this being what is generally allowed by the Courts in those States where the stricter view of the entirety of building contracts is not held. The Supreme Court held, however, that, whereas, the law of Michigan is that a man should pay for that of which he has taken the benefit, even though it is not just what he contracted for, yet "a man cannot be compelled to take and use one "thing, when he bargained for another, and declines to receive "the substitute tendered."

The decision to which the Court referred as establishing the law in Michigan on the subject was one given in a case[11] where a man agreed to cut all the pine timber off an eighty-acre lot, pile it in a certain way on the bank of a creek, and remove the obstructions between the piles and the creek, for a certain price. He did not cut all the pine timber, and did not pile the logs in the manner agreed, or clear away properly the obstructions between the piles and the creek. Payment for the work was refused, on the ground that the contract had not been fulfilled. The plaintiff sued to recover on *quantum meruit*, claiming the contract price less what it would cost to complete the contract. The defendant introduced evidence to show that the work was not worth the contract price. This evidence was excluded by the Court below, which charged the jury that if there had been a partial performance of the contract, from which the defendant derived benefit, the plaintiff was entitled to recover the contract price, deducting any damages which the defendant had sustained by reason of non-performance. It will be observed that this is just what was claimed by the contractor's counsel in the later case; but the Supreme Court, in the earlier one, rejected this theory, holding that the charge to the jury in the court below and the exclusion of the evidence offered were both erroneous. The judges said, in their decision, "When a party fails to comply with an agreement, "unless it is apportionable [or divisible], the rule is well "settled that he cannot sue upon the agreement, or recover "upon it at all. And under the strict common-law rule he "was remediless. But the doctrine has now grown up, based "upon equitable principles, that where anything has been done "from which the other party has derived substantial benefit, "and which he has appropriated, a recovery may be had upon

[1] Continued from No. 889, page 6.
[2] Johnson *vs.* De Peyster, 50 N. Y. 666.
[3] Heckman *vs.* Pinkney, 81 N. Y. 211.
[4] Nolan *vs.* Whitney, 88 N. Y. 648.
[5] Moll *vs.* Foery, 43 Hun. 476.
[6] Pullman *vs.* Corning, 14 Barb. 174.
[7] Bixby *vs.* Williamson, 25 Minn. 481.
[8] Elliott *vs.* Caldwell, 43 Minn. 357.
[9] Denton *vs.* Atchison, 34 Kan. 438.
[10] Masters *vs.* Houck, 39 Mich. 431.
[11] Allen *vs.* McKibbin, 5 Mich. 449.

"a *quantum meruit*, based on that benefit. And the basis of "recovery is not the original contract, but a new implied "agreement, deducible from the delivery and acceptance of "some valuable service or thing. . . .

"Taking this as the basis of recovery, there certainly could "be no good reason for allowing a party who is in default to "recover in any case more than his work or goods may be "worth; for that would allow him to speculate out of his own "fraud or default; and he should not be allowed more than "the same could be obtained for from any one else. To allow "him the contract price for what is worth much less would not, "in any sense, be allowing a *quantum meruit*."

The Court laid down its rule for such cases as follows:

"The defaulting plaintiff can in no case recover more than "the contract price, and cannot recover that if his work is not "reasonably worth it, or if, by paying it, the rest of the work "will cost the defendant more than if the whole had been "completed under the contract. The party in default can "never gain by his default, and the other party can never be "permitted to lose by it; and the price thus determined is the "true amount recoverable on a *quantum meruit*."

In support of this view, the Court quoted an English decision, which says, that "In some cases, a special contract, not "executed, may give rise to a claim in the nature of a *quantum* "*meruit; e. g.*, where a special contract has been made for "goods, and goods sent, not according to the contract, are re-"tained by the party. Then a claim for the value on *quantum* "*valebant* may be supported; but then, from the circum-"stances, a new contract may be implied."

The report of the early Michigan case does not make it quite plain, but it seems as if the logs were cut on land of the defendant. If so, there is an essential difference between this and the question presented to the English court. In the latter, the defendant, on receiving goods differing from those which he had ordered, might have sent them back, and he would then owe the plaintiff nothing, while the plaintiff would owe him reimbursement for whatever damage might have been caused by the failure to deliver the goods ordered; but, having free choice as to what he should do, he chose to keep the goods sent him, and might reasonably be assumed to have, by that act, made, by implication, a new contract to pay for them. With the owner of the logs in Michigan, so far as can be judged from the report, the case was quite different. His trees had been cut down in a way which he did not wish, and had not contracted for; he could not have them replaced on their stumps, nor could he be expected to throw away his property. His only recourse was to take it and make the best of it; and his position was therefore quite unlike that of the buyer of goods, who is free, either to put himself back into the condition in which he was before the contract was made, or to take different goods in place of those agreed upon; and exactly similar to that of the owner of land on which a house has been built in violation of the contract, but who, not being able to abandon his land, or clear the building off it, has not that freedom of action which would seem to be, by the more logical reasoning of Smith *vs.* Brady, necessary to the creation of a new implied contract. In Martin *vs.* Houck, the Court seems to have interpreted the earlier decision according to the stricter view, but there are other cases in Michigan where some uncertainty appears to be shown.

In Pennsylvania, the law on this subject is laid down in the case of Miller *vs.* Phillips.[1] A contract between Miller & Phillips provided that Phillips and another should build a three-story brick house for Miller, for the sum of $1,200; $100 to be paid when the cellar was walled, and the rest when the house was finished. It was also agreed that the building should be executed agreeably to certain plans and specifications annexed to the contract, and should be finished by the following April. The contract was dated October 16. In February, the contractors had erected and roofed-in the building, but it was so badly constructed that it could with difficulty be made to sustain a roof; and the person employed to plaster it abandoned his work and refused to proceed, for fear that the walls would fall down. The work was then suspended, and on February 28 Miller gave written notice to the contractors that he intended to hold them to full and faithful compliance with the contract; that the building as erected was not a good and substantial building, nor as contemplated by the contract. He specified that the materials, or most of them, were bad, and the house not built in a workmanlike manner; that it was so loosely and inartificially erected that it would be absolutely dangerous to occupy it. He said, further, that the contractors must understand that he did not intend to take any such building off their hands; but if the contract was not completed at the proper time, and in the proper manner, he would hold them responsible for all damages that he might suffer in consequence of its non-fulfilment.

On April 27 Miller was informed that the contractors were about to pull down a portion of the walls and rebuild them, and gave them the following notice:

MECHANICSBURG, 27th April, 1857.

MESSRS. PHILLIPS & KING: —

Gentlemen, — You appear determined to persist in going on with the house you commenced for me, under an article of the 16th of October, 1856, notwithstanding the constant and repeated notices that I have given you that I will not take it off your hands, and that I consider our contract at an end. You appear determined now to tear down part, and rebuild. I therefore again notify you that I have no contract with you for that purpose; that I consider our contract of the 16th of October, 1856, at an end on the 1st of April, 1857; that I will take no house that you may now build, fix or patch up off your hands; but that I will hold you responsible for damages for a non-compliance with your contract. You are also hereby notified to remove all materials belonging to you off my lot, as I want the immediate possession of it; otherwise I will be compelled to bring an action against you. Respectfully yours,

JOHN MILLER.

The contractors, notwithstanding this notice, went on, and pulled down and rebuilt two of the walls, including part of the foundation, and proceeded to finish the house, which was completed in July, 1857, and Miller appears to have taken possession and occupied it. They then brought suit on the contract, alleging that the house was now a good and substantial building, and finished according to the contract.

The witnesses for the contractors testified that the house was now "a good common job," while the witnesses for Miller said that it was built in an unsafe, unskilful and unworkmanlike manner. The plaintiffs were allowed to show that the weather during the construction of the building was very severe. The Court below gave judgment for the plaintiffs for $750.

On appeal, the Supreme Court reversed the decision. It said: "The contract in this case was entire, and recovery must "rest on performance, or not be allowed at all. If there be "no performance within the time, the contract may be re-"scinded. If there be substantial performance, with only "minor deficiencies, it may not be. If there be defective, "negligent or worthless performance, it can only be placed in "the category of non-performance; to be treated, as in fact it "is, as no performance or part performance whatever. . . . "After the time was out . . . Miller gave them notice not to "proceed any farther, that on account of their worthless com-"pliance with their contract he chose to rescind it, and he "gave them an opportunity to place themselves *in statu quo*, "by inviting them to remove their material from the premises. "Under the facts disclosed by the evidence, he had a full right "to do so, and it was necessary, if he wished to protect him-"self from being liable for what they might do thereafter. It "was a case in which the undisputed evidence showed that "there was no performance, not merely a case of imperfec-"tion, but of total deficiency, so far as they had gone, and the "work must be done over again to be of any value as a dwel-"ling-house. The employer was not bound in law or morals "to give them another trial of their care and skill. Notwith-"standing the notice, they proceeded with the work, and fin-"ished it, as already stated, about the first of July. Having "disregarded their contract, and the notice of their employer, "they proceeded, at their peril, to rebuild the house. And if "the evidence on another trial shall make out that the work "done between the 16th of October and the 1st of April was "done in an unskilful and negligent manner, and it was not a "substantial compliance with the contract, they will not be "entitled to recover in this suit.

"We think that the principle of recovery laid down by the "learned judge [of the court below] — that if it was a house "inferior to what the contract required, but of value to the "defendant, the plaintiffs might recover — was quite too liberal "to insure full performance by contractors. A work, . . . "though radically defective, might be esteemed of value to "the employer, and if he should, upon this rule, be bound to "pay for it, it would be a virtual substitution of one thing "for another, a liability to pay for what was not contracted "for, and a failure to obtain what was the object of the

[1] Miller *vs.* Phillips, 31 Penn. St. 218.

"stipulation. The law calls for honest, substantial perform-"ance, regardless of trifling defects, when passing upon that "question, and the judgment of men will always determine "what will be a sufficiently close compliance with the require-"ments of the stipulations to insure substantial justice.

"The unfavorable state of the weather," the Court said, "if it may be fairly presumed to have had the effect, against "all due diligence of the party, to delay his operations, may, "in many cases, be evidence; . . . but as the contractor takes "the risk of the season when he undertakes to perform work "at an unfavorable time it should be received with great "caution, and only in aid of a clear equity on his part. He "must have done his whole duty before it should be allowed "to mitigate damages in his favor."

In Arkansas[1] the law has been stated as follows: "Where "there is an entire contract for work, at a stipulated price for "the whole, and part only is performed, there can be no "recovery; but if accepted, or if the work necessarily enures to "the defendant's benefit, the plaintiff should recover the con-"tract price less the amount necessary to complete the work."

[To be continued.]

DAYLIGHT IN THE DWELLING-HOUSE.[2]

Eighteenth-Century Panel, in the *Musée des Arts decoratifs*, Paris. From *L'Art pour Tous.*

IT has been said by some modern philosopher (a German, I think) that it is not necessary to be an architect in order to live in a house, intending thus to set forth that a given theory may be a good and useful framework for your ideas, although you did not yourself invent or develop it. The committee of your Association seem to countenance a variation of this aphorism by inviting a painter to read a paper to you this evening. They do not thereby imply that a painter can be an authority on architecture, but that he may, perhaps, know one or two things about the lighting of a house that are not usually learned in architects' offices, but which yet may have some practical importance. You architects lay yourselves out to be serviceable to all sorts and conditions of men — you build for "the butcher, the baker and the candlestick-maker," and you have it in your power to make their lives pleasant and their home a "desired haven," or, on the other hand, to fill that refuge with "wailing and gnashing of teeth." No other profession in the world has such control over the destinies of men in general, but especially of painters, so I feel sure you will good-naturedly consider their wants before you put in your windows. We shall all readily admit that the first requisite for a dwelling-house in this climate is that it should keep out the weather; and I think it can easily be shown that the next essential quality is that it should let in the daylight (when there is any). Like most things, the letting-in of the daylight may be well done or badly done, and there are more ways of doing it badly than well, so that if left to chance it is likely to prove a failure.

I propose to explain in the first place what good lighting means, and how the windows should be placed so as to enable you to see things well inside the house. My next endeavor will be to show how the daylight, having been admitted, can be economized and utilized by reflection, and that the artistic treatment of the interior largely depends upon reflected light, and on the quality of the reflecting surfaces. You can have a very comfortable life in a tent. A tent, indeed, has charms for enterprising men, second only to those of a ship, the ideal home of the Englishman, whose estate covers the whole surface of the sea. A tent can be quite comfortable and safe, even in howling gales of wind or drifts of snow, and a considerable portion of mankind for generations have found tents quite good enough for common purposes — to eat, to sleep and to die in. But civilized man has a want which a tent cannot supply, viz, a place for the exhibition of his treasures, especially the treasure of beauty, for which stability, permanence, and good daylight are wanted. He also requires a base of operations for his enterprises, a museum for his archives and trophies, and, above all, for the convenient arrangement of his intellectural resources — for his books and his pictures. He may also require means for the entertainment of his neighbors and his children, and for seeing them to the best advantage.

If you can admit that a painter knows anything, you may be sure he knows how to light a picture so that its merits may be well seen, and I think it will not be difficult to convince you that the lighting of pictures is an excellent criterion of the lighting of the house — indeed, a very crucial test of it; but it is evident from our daily experience that many architects have never heard of such a principle, and will exclaim with certain disciples of old, "This is a hard saying. Who can hear it?"

Now, it is not practicable to build for a single individual; you must build also for his guests and for the public. Your client may be the most ignorant vestryman in the three kingdoms, but he will not owe you any thanks if you work down to his own personal level. Even if he devotes his whole life, say, to the choosing of bacon or cheese, he will still like to leave behind him when he dies such a house as shall have the approval of the more cultivated men of his day. Therefore you must provide for the housing of works of art, although they are not mentioned in the specification. When you have done your best the house is sure to have defects. Some of these will probably carry with them compensating advantages, and some can easily be lived down by a philosophical tenant, but defective lighting you will find very difficult to deal with, and in most cases incurable. . . .

The daylight under which pictures can be well seen may be either direct or reflected. If direct, it should not fall normal to the surface. It may come from the right or the left or from the top, but it must not come from behind the spectator, for two simple reasons. The first reason is that his own shadow will fall on the field of view, and the second that the surface of the picture will shine. So that the wall opposite the window is not a picture wall. The aspect of the window is not of much consequence, for although direct sunshine kills delicate color, and is not adapted to show anything well, it can generally be diffused sufficiently for most purposes by a blind of fine texture, and the architect is not much concerned, because the exigencies of the site and the plan will already have determined the aspect for him. The subject of skylights may be put aside for the moment, and windows taken to mean perpendicular openings in the wall. The placing of them should be decided simply on utilitarian grounds — that is to say, how the most wall-space can be well lighted.

External appearance need have no weight in the argument, for a man who cannot make any possible windows compose well in the elevation is not an artist at all, and therefore not an architect. I may even go so far as to say that the more irregularly, unsymmetrically, and arbitrarily they are placed the more scope there will be for developing a picturesque building. From an outside point of view, that is as far as the public are concerned, picturesqueness is the happiest attribute to be hoped for in a domestic building, since it will seldom be large enough to have any claim to sublimity or impressiveness. But there is this to be said on the other hand, that there is no worse form of affectation than the effort after picturesqueness for its own sake. In streets or terraces there is not much room for choice in the placing of the windows, so we generally find such houses comparatively well lighted. It is where the phantasy comes in, as in the country-house or the villa, where your architect is rampant, that you may expect to see some artistic flourishes, constructive mistakes, and incurable lighting.

I believe that if you design your house strictly from the inside, and on merely utilitarian principles, a good external effect is inevitable, or can only be missed through a singular degree of ignorance

[1] Walworth *vs.* Finnegan, 33 Ark. 751; *See also*, Robinson *vs.* Snyder, 25 Penn. St. 203.

[2] A paper read before the Architectural Association by Mr. John Brett, A. R. A., F. R. A. S., and published in the *Architect*.

or meanness. Of course, if you are ignorant of construction, or if you want to produce a more gorgeous appearance than you can honestly afford, there is no redemption for you; you are bound to fail, and to wish that you had never been born, for a mean building is usually destined to encumber the earth, and to disgrace your name for at least ninety-nine years.

Let us at once assume that your client or his heirs will have some beautiful things to grace the inside of their dwelling — and we should not overlook the circumstance that his daughters may be comprised in this category, so we must be careful to light properly this living sculpture, no less than the flat surfaces of the wall pictures. A happy expression on the human face is largely dependent on reflected light, which concerns surface treatment rather than construction, but the fundamental consideration and root of the whole art of lighting depends on having only one single aperture in the wall, so that the direct rays may all enter parallel, and not in conflicting directions. In artists' studios you will always find this rule carried out, and I will now attempt to explain the reason for it.

Let us suppose you have to draw a portrait. A single high-light on the head involves a shade in exact proportion to it, which you, as a draughtsman, can supply without any chance of error. The cast shadow likewise will have a known well-defined and inevitable relation to the shade. This simplicity of light and dark enables you easily to grasp the form, and to appreciate its undulations without uncertainty or confusion; whereas, if you have two sources of light allowing rays to enter in two different directions, not only will you get on your model two high-lights in inconvenient rivalry, but all your shades will be complicated and put out of their normal relation to their lights. The unity and simplicity of one shadow will be marred by the intrusion of another, and the result will be that your apprehension of the real undulations of the surface and the beauty dependent on them will be hindered, and considerable spaces of the surface will have no meaning for you, the beauty revealed by one ray of light being neutralized or blotted out by others proceeding in a different direction, so that the seeing is very considerably impaired, and the form shown at disadvantage.

This is one important argument in favor of establishing only one inlet of light in each room. But there is another argument even more important, because it affects not merely the form of an object but also its color and texture, in fact, it fundamentally affects your seeing power. The subjective effect of cross-lights is to diminish the pupil of your eye, thus curtailing absolutely your physical power of vision. Suppose, for instance, your room has two windows, one facing south and the other west, you will necessarily enter either on the north or the east side, since both the others are outside walls. Whichever door you enter by you will find a window light shining right in your face. You will encounter your visitor, say, in the middle of the room, exposed against the glare of the south window, he telling as a dark patch. This is not the chief mischief to which I am asking your attention, since the light from the west window may show his surface sufficiently well to be recognized. The main point is this: the light from the south window closes up the pupil of your eye so that it will admit only about half the quantity of light that you are capable of perceiving, and the effect upon you is equivalent to depriving you of one eye altogether, that is to say, your visual ability is crippled to the extent of one-half, so that, whilst you flattered yourself that with two windows your room would be twice as light as if it had only one, this advantage is neutralized by your being disabled from using half the available rays, to which must be added the further disadvantage that your visitor is exhibited under the most unfavorable conditions of light and shade.

In order to use all the seeing power that nature has provided you with, it is necessary that the light should reach your eye after having illuminated the object you want to look at, and, further, that the pupil of your eye should be encouraged to open to its full size by being shaded from the glare of direct rays. For these reasons the consulting physician always places himself in the shade and you in the light.

As all architectural structures have upright walls, such as are very convenient to look at, it is important that they should be well flooded with daylight, so as to show such pictures as you have; and next it is advisable to economize those walls as fields of beauty, and not carelessly cut them up by chasms for doors or fireplaces. Seeing that your house is not to be a mere shelter or casual-ward, but an intellectual preserve, it is worth while to relegate such interruptions of wall-space as far as practicable to the corners. I know that there is nothing more painful to the soul of the modern architect than a blank wall, and that sleep for him is impossible until he has broken through and destroyed that invaluable area of repose. So mad does it make him, that he has been known to build-in unnecessary pilasters in order to divide it up. I will venture to remind him that the impressiveness of a building from the outside largely depends on great unbroken areas of wall, and that these may be well studied in mediæval fortresses, which are admitted to be the most picturesque structures existing in Europe. Take, for instance, the Castle of Ivrea, in Piedmont.

I think it may be taken as a general principle, that any architectural design that is so complete in itself as to forbid the intrusion of the subsidiary arts is not adapted for a dwelling-house. I know a man whose house was finished by Owen Jones. He is very fond of pictures, but has to keep them piled up in stacks for fear of spoiling his walls.

I have noticed that very young architects are instinctively aware of the value of accessories, since in their perspective drawings they do not hesitate to balance a poor, lop-sided composition by the introduction of a carriage-and-pair, nor to collect a vagrant assemblage of pinnacles into a group by the judicious insertion of a tree. No doubt, a good house ought to be adapted for an advancing civilization. We read that Old King Cole's wants were very limited: "He called for his pipe, he called for his glass, and he called for his fiddlers three"; but there is a young King Cole, now — a being to whom a sideboard, a billiard-table, and three fiddles do not comprise all the indoor requisites. He calls for his books, his pictures, and his sculptures three, and if you architects practically ignore or suppress these luxuries, as you have been doing of late years by your abuse of daylight and your ignorance of its application, you will drive your young client to let his new villa for a lodging-house, and to spend his time and cash in foreign travel.

A neighbor of mine is just now building a rather expensive house in the suburbs. His architect is evidently bent on doing something quite original, and amongst other peculiarities he has placed all the day-rooms under a deep veranda made of copper, calculated to keep out all the daylight. The poor client, I surmise, had no idea what the first consequence would be, viz, that he must straightway get rid of such works of art as he had and abjure every sort of beauty for the rest of his natural life. The unfortunate man will have very long gas bills.

We have arrived now at one well-defined and very important rule, which is that the daylight should be admitted to a room on one side only. Of course, every rule may have exceptions. On the east coast of England you will have noticed many little towers, built usually of wood, with an outlook in three directions, viz, up the coast, down the coast, and out to sea. These were wreckers' nests, where dwelt those whose livelihood depended on ships cast away upon that inhospitable coast and robbery of the unfortunate mariners. A short time ago I was spending a day at Greenwich Observatory, where the chief day-room had windows to the north and the west. This was one of those rare deviations from my rule that could easily be forgiven, for each window looked out on one of the most beautiful views in England. When you entered that room you never for a moment thought of what was within it, although good taste reigned. You walked straight to one of the windows and remained there. No one could find fault with the judgment of the architect. Here was an exceptional opportunity not to be passed by, even at the cost of an ill-lighted room, for the summer outlook on a paradise was worth some sacrifice. Having resolved on that sacrifice, he could easily afford to violate comfort, as he has done, by a French window; but it opens into an old English formal garden, with quaint apple and fig trees in it, such as would charm the soul of Mr. Reginald Blomfield. These are the only exceptions to the rule that occur to me. That part of a window which is most valuable is the top half, as it admits most light per square foot. The lower part only admits light reflected from the earth, and more or less colored; therefore roll-blinds from the top should never be allowed. Any other form of curtain is less mischievous, but a roll-blind should be fixed at the bottom.

In a well-lighted house the windows are carried right up to the cornice. Window-heads, whether traceried or lancet, may be admirable, but should be reserved for other buildings where people do not dwell. If you ask yourselves the question which rooms are pleasantest of all those you have known, I think only one answer can be given, and it will be this: those rooms are pleasantest in which work is done. Few would reply, "Those from which you have the best view." The man who would say so must be one whose home is sad, solitary, and unlovely, whose memories are the only beautiful visions on which his thoughts can linger. How often do you resort to your window with relish and turn away from it with reluctance? In your town experience, I may confidently reply, "Never." If you decide the question by the suffrage of all the fairly cultivated men and women you know, I think the vote would be given in favor of the painter's studio, which has either a skylight or a window too high to look out of. I believe few, even amongst women, would vote for the drawing-room. It does not usually fall to the lot of gentlefolks, to spend much time in workshops, but if you have a wide experience you will cherish the remembrance of the days you have spent with the goldsmith, the blacksmith, or the carpenter; and none of those shops were lighted by architects, none of them had any outlook. If you would rather look out of your nest than into it, then must your life be sad indeed, and you had better get away into the wilderness or to the top of the Hindoo Koosh.

There is in the city of Timbuctoo a great town-house which illustrates nearly all the blunders that can arise from ignorance of lighting. The sheik is a man of the utmost good-nature and nobleness of soul, and takes pleasure in his splendid possessions just in proportion to the number of intelligent men who will share their enjoyment with him, so I surmise that some of you have been his guests. He has a collection of pictures of first-rate importance, but his ingenious architect has so contrived the interior that hardly any of them can be well seen. The value of some of the pictures is so great that a very few of them would cover the cost of the whole building, yet many of them are condemned to blush in dark corners in order that the architect should indulge his childish taste for symmetry. The principal suite of rooms face the south, and are all lighted in the orthodox way, viz, on their long sides. The opposite long walls do

not afford any good lighting, because, as I pointed out, your own shadow and the sheen on the pictures conspire to render them invisible; and the gigantic fireplaces occupy about a third of the area even of these walls. The only well-lighted spaces that the plan allowed were the short walls that stand north and south. These he has wantonly and ruthlessly wasted by opening a vast doorway in the middle of each of them big enough for the gate of a city, and so the design was finished.

I think many architects would be surprised if they knew how fine an effect is produced by entering a room at the corner instead of at the side. It must be very unusual, since I do not know more than two or three instances of it. Its charm depends on the varied angles under which the walls present themselves to the eye when you enter, as all of them are seen under oblique instead of parallel perspective, and the suggestion is conveyed that you should go on and prosecute your researches in the ramification of the structure. You are not confronted by a flat opposing partition right across the line of advance.

All deviations from mere symmetry are dear to the soul of the artist, because they give occasion for composition — that is to say, the creative faculty; and if there were no other reason for placing a window out of the centre of the wall, this would be sufficient, but as a matter of experience many reasons for doing so are not far to seek. There are instances in which one whole wall is filled-in with glass, and with excellent effect. There is one in a house very near my own, built by Mr. Waterhouse. It is the window of a fine staircase, the other whole walls of which are well lighted and well adapted for pictures, but, alas! the use of the stained-glass in the window has put this out of the question, and, instead of an intellectual feast of fine art, you are indulged with some admirable color and design in the glass itself, but the walls are wasted.

Let us now turn our attention to the second division of our subject, and determine how to deal with the daylight when we have let it in. This important question is too often shirked by the architect, and shuffled on to a scapegoat called the decorator. This pernicious person has the power of doing immense mischief at small expense, so he does it with no niggard hand.

For a concrete example, let us refer back to the great house in Timbuctoo. The picture-show begins at the dining-room, the walls of which are covered with a rich stamped leather of dark maroon and gold, affording a fine background both for pictures and guests. The decorative mind was just able to grasp this principle, and, knowing there was "nothing like leather," he carried it right up from floor to ceiling, absorbing that part of the wall which is too high above the spectator to be serviceable as background, and destroying its power of reflecting light, which is the only function it could have fulfilled, and would have fulfilled with admirable effect if its surface had been tinted with tempera or an ordinary wall-paper of a cream color. The ceiling, as usual, is cut up with mouldings and coloring of senseless pattern; but even if it were well designed he would surely be an odd sort of visitor who would turn away from Vandyke or Sir Joshua Reynolds to gaze at the ceiling. A few sixpenny buckets of whitewash expended on that ceiling would have redeemed the room, and proved that it belonged to an intelligent human being. Whitewash is a by-word with the modern æsthete, but it has its uses.

There are two different conditions under which light can be reflected. They are known in optics as whole light and scattered light. Whole light advances in one direction only. An ordinary plane mirror reflects whole light. The light called scattered light proceeds in all directions at once, and cannot be focussed by the eye so as to show images. Such is the light reflected from any granulated or dead surface, such as tempera, snow, or sand. If you require a polished surface to reflect light into a dark corner it will fail to do so unless it is placed at exactly the proper angle, whereas a scattering surface will be efficient at any angle. All surfaces that are not strictly required to do duty as backgrounds should have a scattering surface, so as to diffuse the illumination, and the lighter their color the more efficient they will be for this purpose.

In Italy, unfortunately, there is more or less good art displayed on the ceilings of the great houses. All men who have seen it will agree that it could not have been more foolishly misplaced or more effectually wasted. The greediness that asks for every surface to be made beautiful is not only a childish greed that wishes all bread were cake, but an immeasurably mischievous one, for there is in every room one surface that can only render good service when kept plain, and so enabled to set off to advantage the beautiful things that are more favorably placed for examination. That surface is the ceiling. The ceiling is an invaluable reflector and economizer of light, and that is the only thing it can do thoroughly well. If the economy of daylight by reflection is to be overlooked, all art may be banished from the dwelling, for few things are more painful than the spectacle of beauty wasted.

An excellent reflector of scattered light is a white linen cloth. It is well known that people look their best at a dinner-table, and I suppose it has been the practice in all civilized ages to serve the dinner on a "fair linen cloth." When the lamps are alight a strong reflection is sent up from the table-cloth into the faces of the guests, filling their shady recesses with a warm illumination, and giving them a more or less angelic appearance, or at all events, putting away the lowering and gloomy evidences of hunger and ill-temper.

Your architect will gladly provide you with good shelter where a horde of menials can eat and sleep comfortably at your expense. Viollet-le-Duc is careful to go farther, and provide that you shall look out on the prettiest view, but he calmly assumes that you are sure not to have anything inside your house so well worth looking at as the houses or shrubs opposite, and the historical conclusion of the whole matter is that in the reign of Queen Victoria, in nine great houses out of ten, any kind of art is out of place, for the simple reason that the architects have misused the daylight and wasted the wall-space.

One word more has to be spoken as to the use of stained-glass, and it is this: If you wish to indulge in stained-glass you must make it your one and only form of color-decoration. You can have superb color in your window, but you take away its usefulness as a source of light, and make it an object to be looked at, and when you have looked at it your eye is unfitted to see any other color. Even the splendid tints of Eastern embroidery or carpets cannot stand the competition: white light is absolutely necessary for the display of their beauty.

Mr. Burne-Jones lately designed a beautiful picture, and Mr. Morris worked it in tapestry for the glory of the chapel of Exeter College. Some ingenious person has placed it on the same wall with a gorgeous stained-glass window, and opposite to another, so that none of its fine color can be seen. I need not enlarge on this subject. Once seen, that painful spectacle can never be blotted out of your memory. The color of your reflective surface is only one degree less important than the color of your window-glass itself.

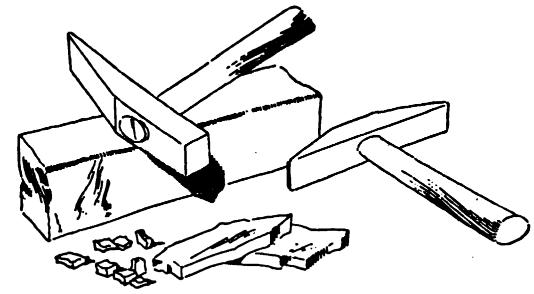
I once knew a physician who had the walls of his consulting-room painted of a strong uniform green. He was quite unaware of its professional advantages, and said he thought it restful to the eye. His decorator had told him so, having doubtless heard that green shades were used by people with weak eyes. As a matter of fact, all his patients appeared to have the cholera, and it had to be repainted.

A few years ago nearly every reception-room in London was papered with a dull sage-green — a sad emphasis to lay on the depressing climate we have to live in; but a good man and a friend of mine was responsible for it. I am afraid you will think I display an unreasoning animus against the architect, and that I have spoken rashly and at random as to his ignorance of the use of daylight. But that is not so.

There is an institution in which I lately offered to endow a prize for the best design for a house in which pictures could be well seen without a special gallery constructed for the purpose. The Council were pleased with the idea, but, scorning my modest 25*l.* a year, made it into a handsome 200*l.* Two or three distinguished architects were appointed to judge the competition, and they actually awarded the prize to a design which afforded not one single well-lighted wall in the whole structure, and yet none of them were aware that they had done anything ridiculous.

There is a good deal to be said as to skylights in lighting the dwelling-house, but you have probably heard more than enough on the sacredness of the wall and the importance of one window. Allow me to suggest, in conclusion, that these matters are worthy of your most serious study.

MODERN MOSAIC.



-The Block and Hammers-

MOSAICS may be made of almost any material. It is, however, the purpose of this paper to deal only with those made from marble, tile, enamels or glass, and used for decorative purposes, for floors, walls, ceilings or panels.

Mosaics may be made directly in the cement at the place where they are to remain, or they may be prepared at the shop and afterwards set in place. Where the first method is employed, the surface to receive the mosaic is covered with a layer of mortar, on which the pattern or design desired is drawn by means of a pounce pattern. The bits of material of which the mosaic is made are then pressed into the soft mortar until the work is completed.

Since this process requires considerable skill and time, it is seldom used, though undoubtedly much better and more artistic effects can be produced by it than by the other and more common method. In these days, when "time is money" and everything must be done quickly and as cheaply as possible, a method somewhat more mechanical, requiring less-skilled workmen and admitting of quick work, is used.

Of course, the first thing required, no matter which method of

execution is used, is a colored sketch fixing the design, after which the full-size drawing, complete in outline and color, is made. Should this be a large piece of work, having portions repeated many times, pounce patterns, stencils or other mechanical means for duplicating the drawing and saving labor are employed.

Should the plan or design *not* be symmetrical on an axis, it is drawn in reverse; that is, the portion to be on the right hand when the mosaic is finished is on the left hand when the drawing is made. Lettering is drawn backwards, with the last letter on the left instead of on the right. Thus, "Cave Canem" would be drawn

Cave Canem.

The reason for this will be apparent farther on.

This detail or working drawing is made on a stout manila paper, not too thick.

Accompanying the detail is a scale-drawing, which may be called the cutting-drawing or key. This is often made on tracing-linen for convenience, as, the cloth being transparent, the workman can then see the drawing either as representing the work when finished or the mosaic in the "reversed" position.

The working-drawing is spread out on a table or the floor, and upon the back of it is drawn at random a network of scrolls and interlacing lines. These do not assume any particular form, as they serve as guide lines only for matching the pieces in which the drawing is cut as the work proceeds.

In addition to these irregular lines, two straight lines at right angles to each other are drawn, representing the principal axes of the design. This done, the drawing is turned over, and lines dividing it into pieces about eighteen inches or two feet square are drawn. Similar lines are also drawn on the scale-tracing. These lines follow as far as possible the outlines of the design. The drawing is then cut on these divisions, and each piece numbered on the back, a corresponding number being placed in the respective square on the tracing.

The sections of the drawing are then given to the workmen, each taking one or more. On these sections the workmen paste, face (that is, the smoothest side) down, the tesseræ of which the mosaic is made. The pattern is filled-in first, each workman usually setting but one color. When he has finished all the portions to be filled with the color he is using the section is handed to his neighbor, who lays in the next color while the first man begins a new section. This process is repeated from one man to another until all of the pattern or ornament is finished. Then the background is laid. This is often done by boys or apprentices. It is customary to make the first line of stones next the ornament follow its outline, but all the rest of the ground is laid in straight lines. When all sections are filled they are placed together, much as one sets together the toy "chopped-up pictures," on the floor or some convenient place, until the pattern is complete, but just the reverse of that which it will be when finished. Moreover, the side of the stones then seen is the side that will be set in the cement.

By slightly moistening with water, the color of the marbles is brought out so the workman is enabled to judge somewhat how the finished work will appear.

Certain corrections that it may be desirable to make are attended to now; then the parts are again separated, packed, and shipped to the place where the work is to be put up.

Mosaic is set in a mortar made of Portland cement, pure lime and sand. The lime is used to retard the "set" of the cement, that the mosaist may make such changes as are necessary. When the work has been corrected and levelled it is flooded with pure lime, which fills up all the joints.

A certain amount of preparatory work is always done by the builder before the mosaist begins his work at the building. This includes, for floors, a bed of concrete levelled off with cement from one-and-a-quarter to two inches below the finished floor level, and at least two inches above the top of the beams. For walls and ceilings a solid bed must be brought to within one inch of the finished mosaic level. If the ceiling is to be supported on the under side of wooden beams the bed is prepared by nailing furring-strips across the beams, and on these stretching wire-cloth lathing. Cement is spread over this, making a coating about one inch thick. Some mosaists simply scratch this before applying the next coat; others drive in nails of wrought-iron having very broad, flat heads, which serve to hold the final coat of cement, one inch thick, in which the mosaic is set. If the ceiling is of brickwork the nails mentioned above are driven in the joints, and the final coat of cement only is used.

The cement having been prepared the sections of mosaic on the paper are again set together on some convenient floor-space. Two chalk lines are stretched a half or three-quarters of an inch above the cement to represent the axes of the work in hand. The central piece of mosaic is lifted by the workman and turned over, paper-side up, on the cement prepared for it. This is carefully adjusted until the lines drawn as axes upon the paper are directly beneath the cords stretched as guides above the work. Then the adjoining piece of mosaic is set on the cement. Here, in addition to making the outline of the edge of the part fit exactly the edge of its companion piece, care is taken to match the portions of the irregular lines which were drawn, as mentioned above, before the paper was cut in sections, thus insuring that the design is perfectly matched.

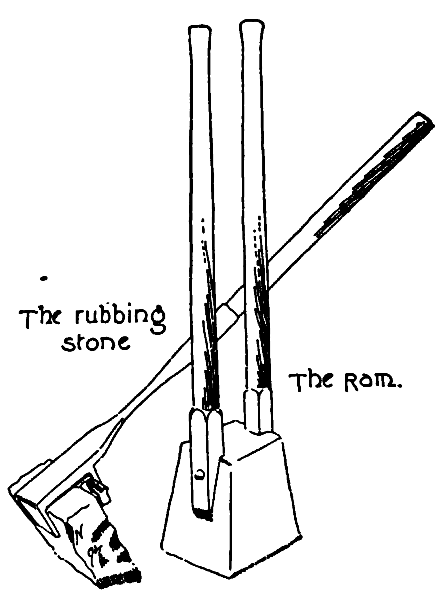
This process of joining one section after another in the wet cement continues until the entire mosaic is laid. Then it is beaten and rammed into the cement, after which a plentiful supply of water is used to soak off the paper so as to leave the mosaic exposed. This is now carefully examined, tesseræ that are "off color" are picked out, lines corrected, or any other changes made that are thought necessary.

After thoroughly levelling by rolling with a heavy stone roller, the work is ready for polishing. This is accomplished by the use of a rubber made of sandstone fastened in a long handle. This is pushed back and forth over the mosaic, which is sprinkled from time to time with sand and water. Coarse sand is used first, then finer, then pumice and emery until the marble is of a smooth even surface. Mosaic is seldom polished more than to a dull smooth finish. The condition of the work immediately after rubbing is such that it is allowed to stand for several weeks before anything more is done to it. The marble is full of water, and salts from the mortar will soon show themselves by a beautiful white efflorescence. As soon, however, as the work has dried and cracked (for if the work is a large one several cracks will show themselves as the cement dries) it is carefully repaired and cleaned. It is then well soaked with raw linseed oil which is rubbed in, thus strongly bringing out the colors. Finally a wiping off with turpentine and wax gives a finish.

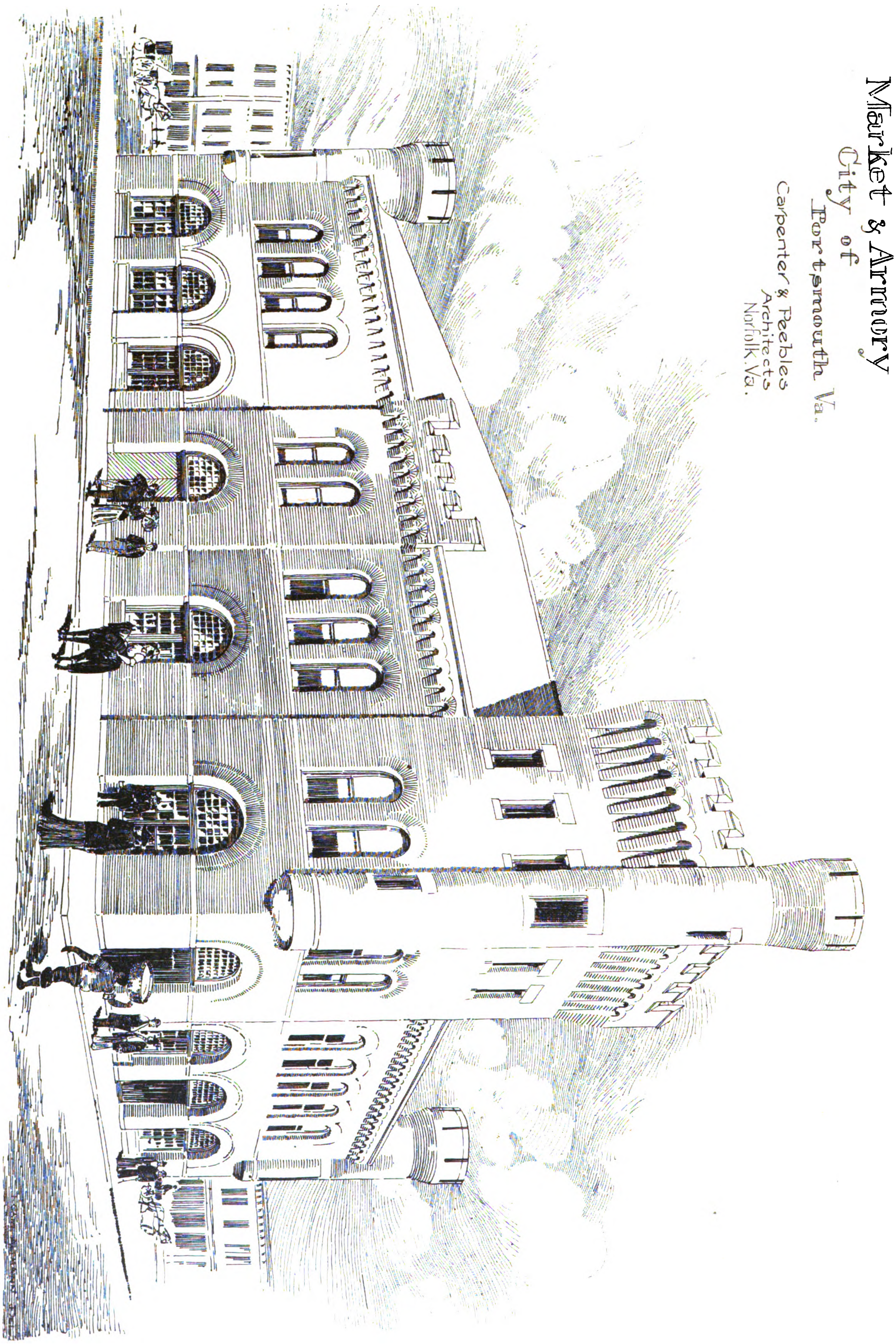
It is a difficult matter, if not almost impossible, to polish ceiling or wall mosaic after it is in place. For this reason a simpler and easier method of procedure is adopted. The tesseræ to be used are laid irregularly in a thin bed of cement on the floor of the workshop. They are next rubbed and polished, but not oiled, the same as described above. When cleaned with water the work is broken up, and as the cement bed is very thin and fresh it is easily separated from the tesseræ. They are then used to construct ceiling or wall designs, the smooth face of the marble being pasted against the paper. When set in place and the paper removed the work is smooth and even, requiring only such rubbing or cleaning as is easily done by hand. Many artists, however, prefer to have ceiling and walls of the rough, irregular surface produced by the sawed or broken edges of the tesseræ.

Mosaics are principally made of marble and an opaque glass called enamel. Marbles are used for floors, hearths, or places which are likely to be walked upon; while enamels, sometimes improperly called glass-mosaics, are used for walls, ceilings, fireplace-facings, ornamented panels, pictures, and the like. The palette for marble mosaic is somewhat limited, even though many stones improperly called marbles are used to fill out the list of colors. Reds, yellows, and whites are easily had in several shades, the finest coming from Europe. But green can be obtained only in one or two varieties, including the Alps or Royal Green, which is expensive, and difficult to cut into cubes. Many stones that otherwise would be very useful have lines of fracture so irregular that they can hardly be cut for mosaic work.

The method of cutting the cubes is simple and often done by boys. The cutter sits astride a box or bench on the edge of which, in front of him, is placed a piece of soft iron about ten inches long and three inches square, called the block. On the floor in front of the bench is a box to receive the cut stones. Lying about are the pieces of marble, usually the refuse from the marble yards, to be cut. In one hand is a hammer, weighing about two pounds, and having one or both ends chisel-shaped. These ends, the sharp ones, are tempered and set on the handle in a position similar to the blade of an adze. Taking a piece of marble the workman holds it against the iron in front of him, then, with a sharp quick blow with the edge of the hammer, the marble is cut in smaller and smaller pieces until the desired cube is formed. It appears so easy that an observer does not realize until he tries the experiment how much skill this simple operation requires. Yet experienced boys will cut a quarter-inch stone held between thumb and finger much more quickly and surely than a novice would cut one four times that size.



Enamels for mosaic are made in discs about six or eight inches in diameter and three-eighths of an inch thick. All colors and shades are made so that in this class of work the artist is not at all limited in his color scheme. The discs are cut in cubes by means of a chisel-shaped tool, fastened edge up in the work bench, or on a stand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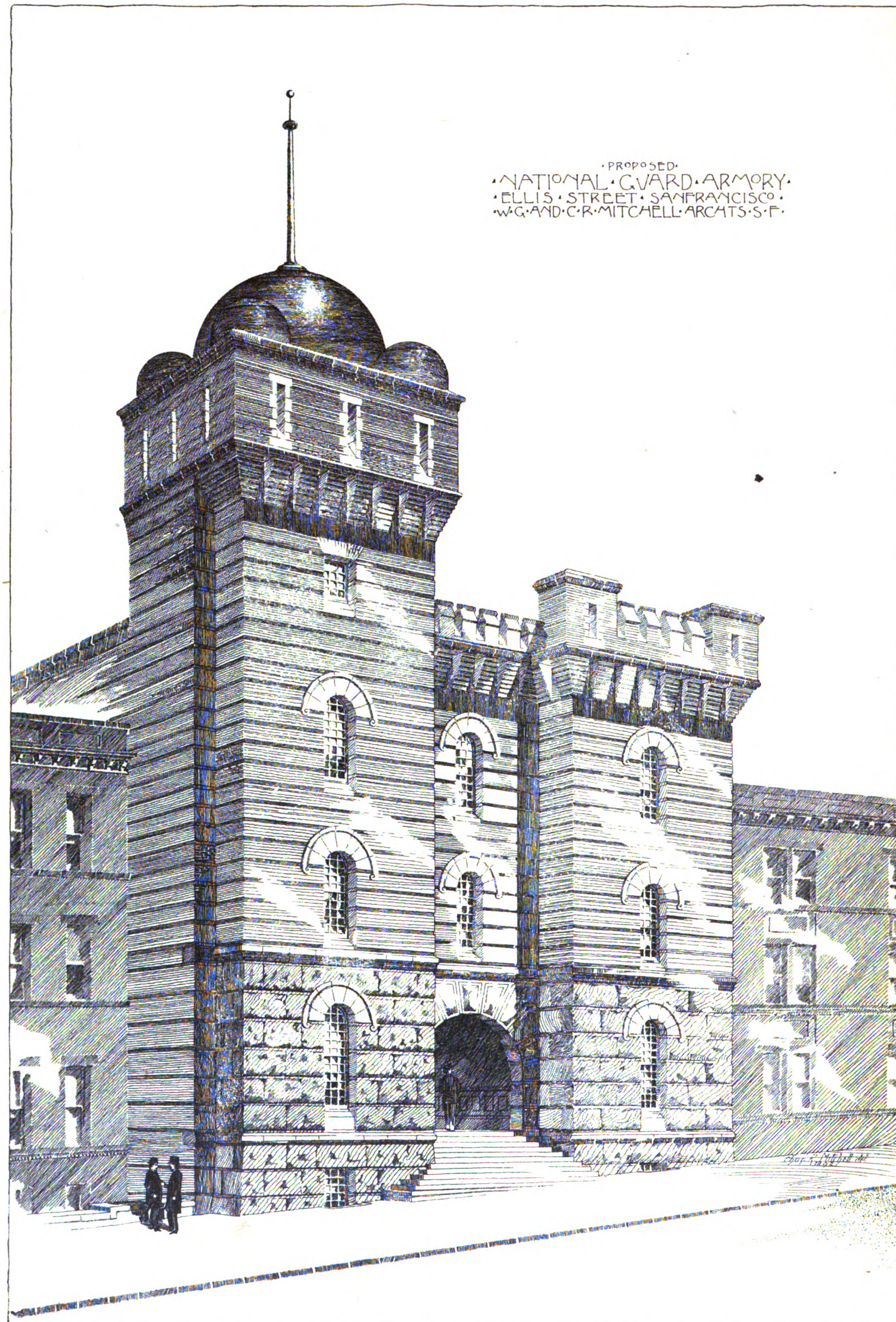

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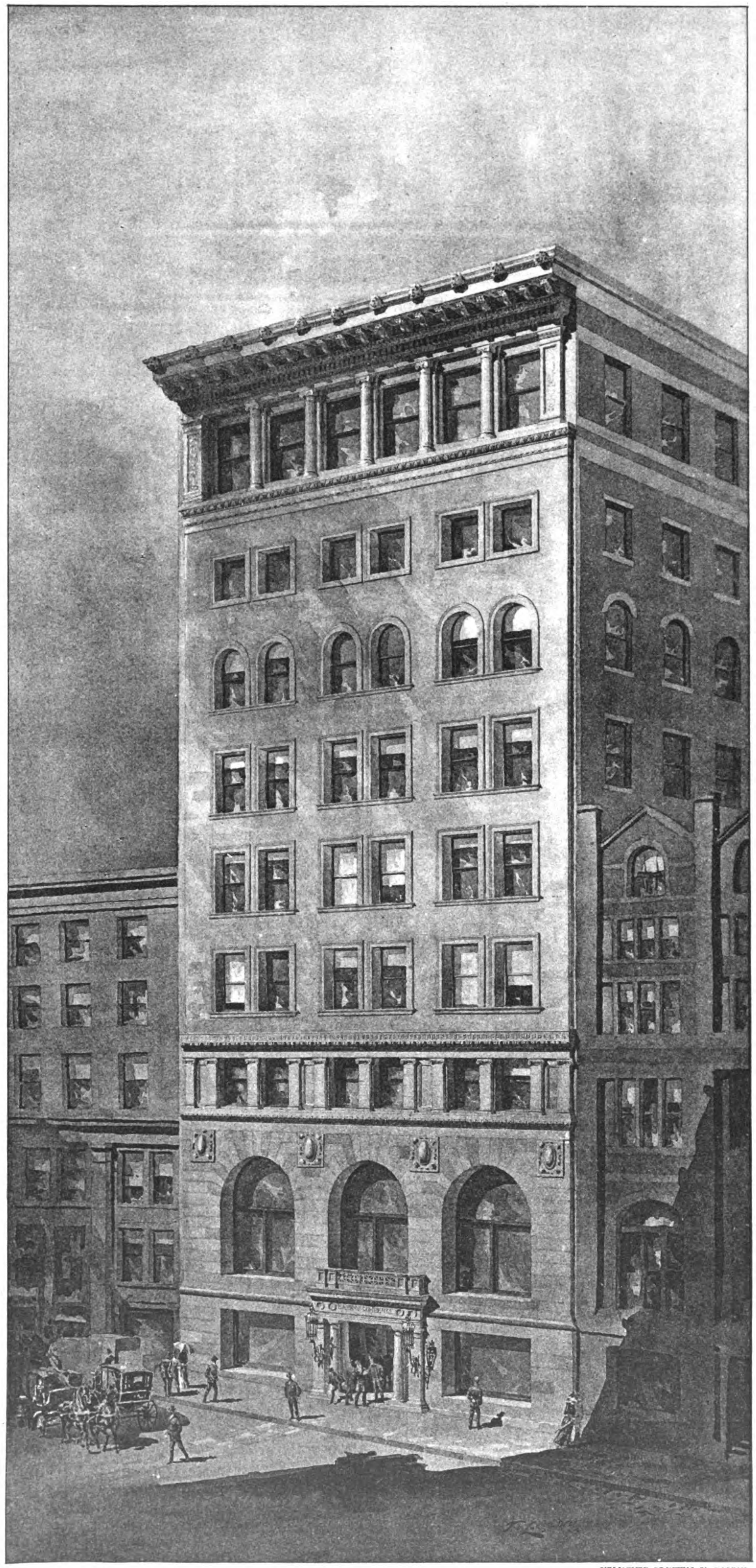

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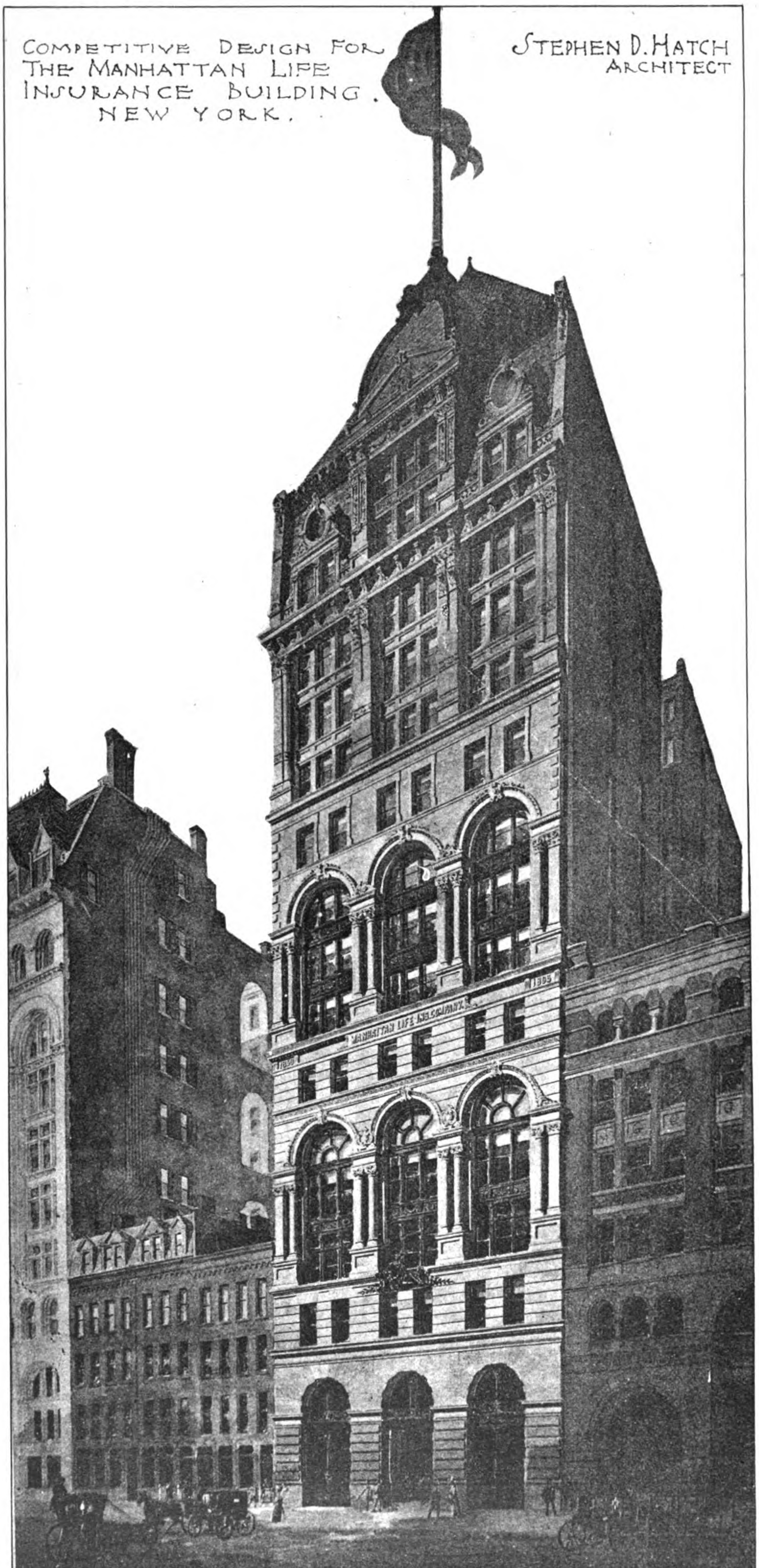

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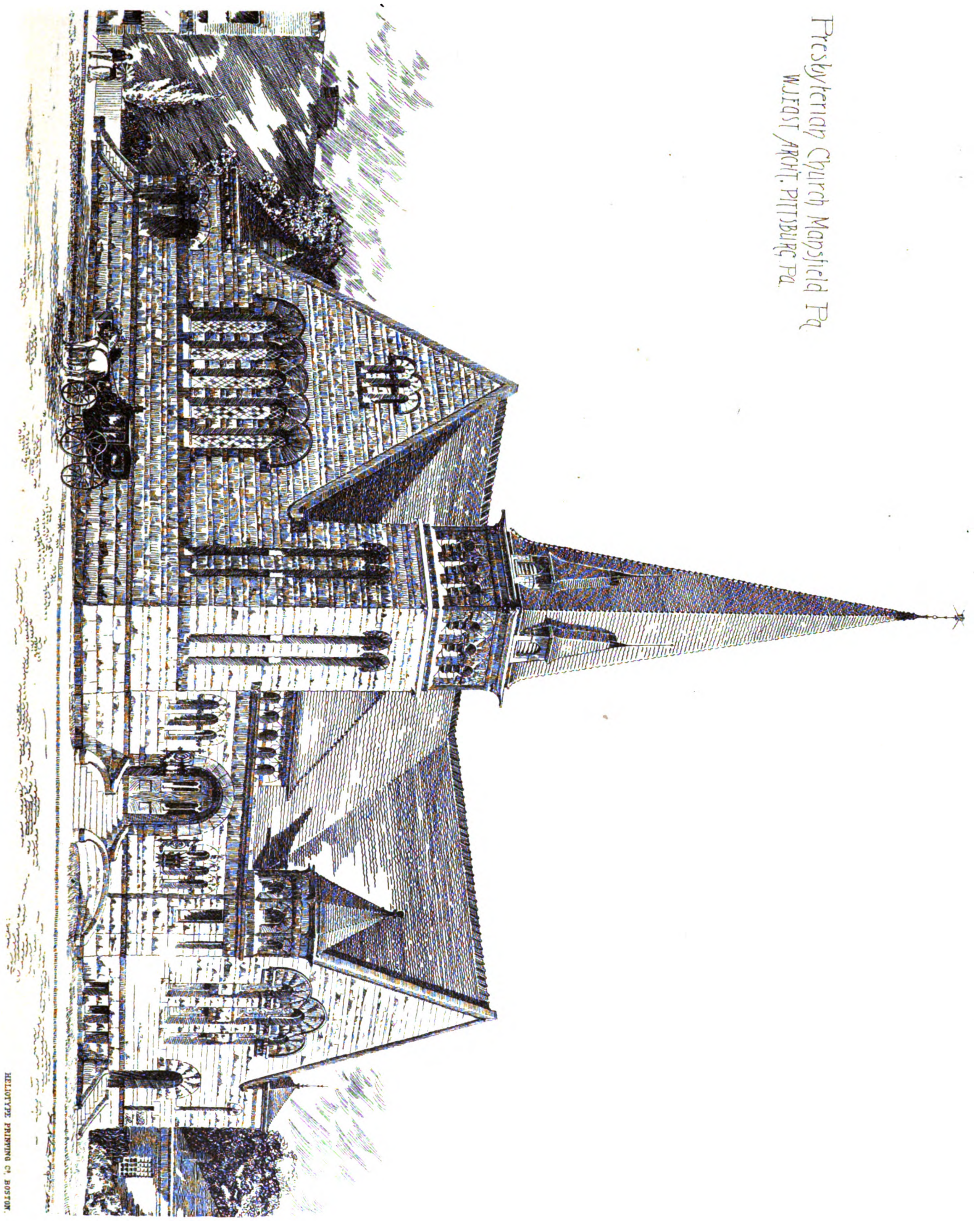

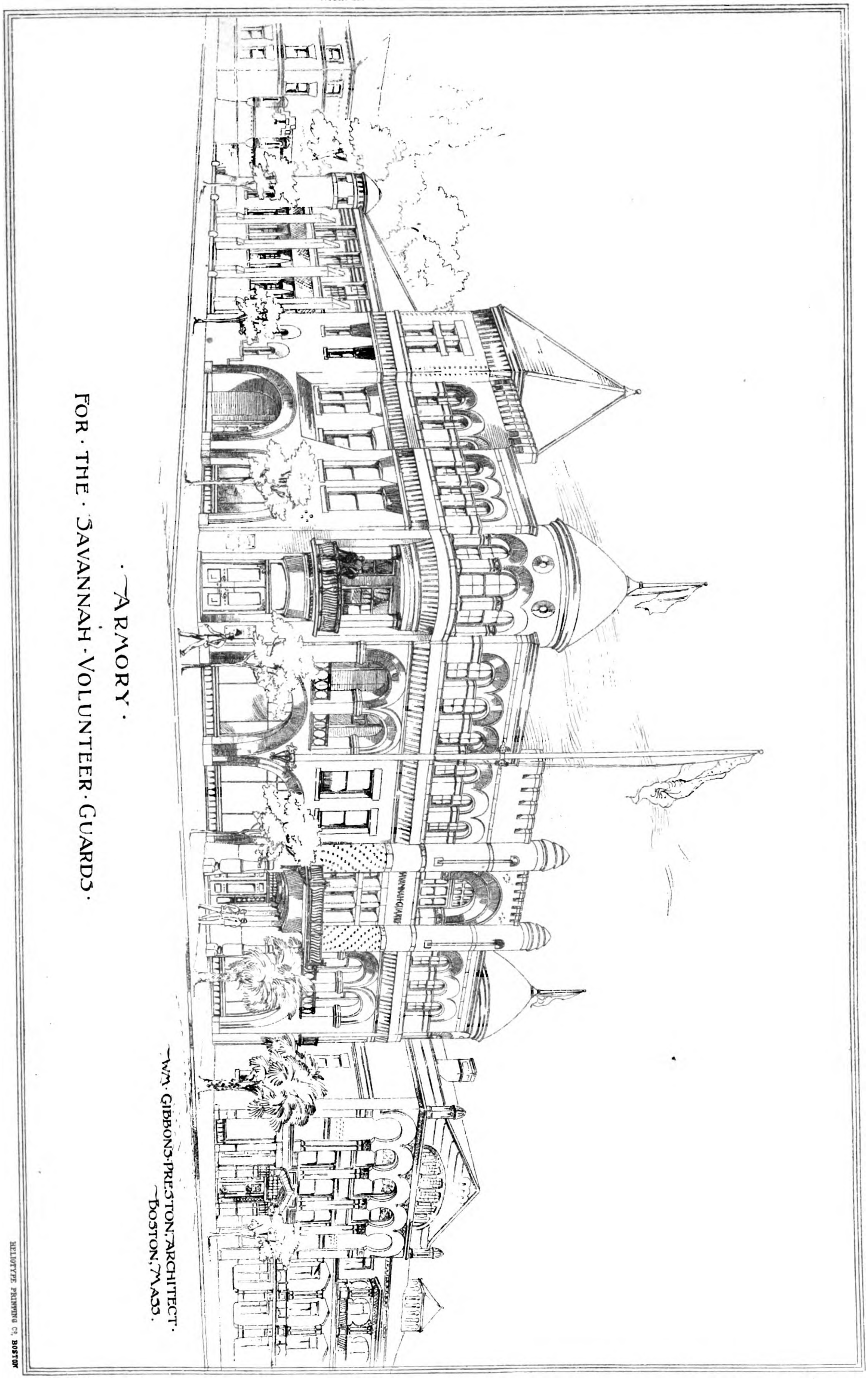
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made especially for it. The disc is placed flat against this chisel and struck with the cutting-edge of a hammer, as was described above for marbles, the chisel replacing the "block." Enamels are really an opaque glass colored by various metals. They are much lighter, more brilliant than marble, and break with a clear sharp fracture.

In connection with them, so-called gold and silver enamels are used for backgrounds. The metal is a very thin leaf covered by a film of glass. This is accomplished by taking a disc of very thin clear glass, slightly concave. In the hollow a sheet of leaf metal is placed and both heated until the glass almost softens. Upon it is then poured the material for the back. This for gold is a dark-red glass, and for silver a green.

Enamel-mosaics, as before mentioned, are sometimes called glass-mosaics; but this leads to confusion, for there are mosaics made from transparent colored glass. These, however, are used only for wall-decoration and principally for ornamental panels. They may or may not be silvered or gilded on the back. The method of working is very much the same as with marble or enamels, except the glass is not pasted on the design but is laid upon a piece of clear sheet-glass placed over the drawing. The work is kept in position on this sheet of glass by Venice turpentine, which holds it sufficiently to prevent the pieces from becoming displaced. The cementing material for this class of work is plaster-of-Paris, or Keene's cement, which is poured upon the glass as it lies face down on the work-bench. When this has hardened, the panel is picked up, turned over, and the face cleaned: it is then ready for setting. If the design is a very large one, it is made in two or more slabs which are joined as the work is set in place, the operation of setting being similar to that of setting any slab of marble.

The cost of mosaic varies according to the design, the prices usually being quoted as so much per square foot. For marble mosaic the material is not very expensive, one square foot of mosaic requiring from seven to ten pounds of marble, which, for imported marbles, cost from five to ten cents per pound. It is considered cheaper to do a large piece of work having over one thousand feet than to do one having less. That is, taking the same design for which there is wanted but two hundred feet, it would cost more to execute, per foot, than if there were one thousand feet.

Hearth-stones and fireplace mosaics are made in iron frames so they may be set by any mason. They vary in price from thirty-five dollars up, according to design and size. Enamel-mosaics cost from fifty to one hundred per cent more than marble, and glass about the same as marble.

A word might be said in regard to the kind of drawing used for mosaic-work. If it is known that the mosaist to execute the work is an artist, the best result will be obtained by giving him the working-drawing in charcoal, as this will allow freedom for the display of individuality and skill in carrying out of the work. Should, however, your drawing fall into less skilful hands, the result might be deplorable, owing to his not understanding or being able to follow the design. It is then best to give a pencil drawing carefully and clearly made, but not having a too fine and sharp line.

If the lines are sharp and very finely drawn the average workman will spend a great amount of time in cutting and squaring the stones to follow it exactly, thereby producing a result which is stiff and mechanical in appearance; whereas if the lines are broad and ragged, yet have the character and feeling called for by the design, the artisan cannot follow the lines mechanically and must use his mind somewhat in placing the stones, thus giving the work a more graceful and easy appearance.

ALVAN C. NYE.

THE EVOLUTION OF THE MODERN FIREPLACE.

Miserere in Choir of Amiens Cathedral. From *L'Art pour Tous.*

OF the many changes and improvements made in the homes of limited circumstances nothing is more noticeable than that in the fireplaces. Where twenty years ago the white marble mantels with little grate baskets set in their small oval openings gave a cold and grave-like finish to the rooms they were supposed to decorate we now find wood mantels, under which are set andirons or baskets, with fancy or artistic backings relieved by facings of tiles.

The introduction of steam and hot-water heaters has done much to increase the use of wood mantels. When the fireplaces were used to heat the rooms in which they were situated the high temperature to which the mantels were subjected made it unsafe to use wood, and slate or marble was employed. The furnace made little change, for the registers from the hot-air ducts were often placed in the fireplaces (the smoke flues being closed) and the warm air striking the woodwork in the mantels caused it to crack; so slate and marble mantels were retained. In many cases fireplaces were discarded altogether, and at one time, especially in Philadelphia, there were no fireplaces put in the buildings, and those in the older houses were closed with a marble slab.

The use of steam and hot-water heaters emphasized the need for ventilation, and fireplaces, which all admit to be the best of ventilators, again came into use; upon this they became merely *decorative vents*, and the danger of using woodwork was no longer feared.

An occasional fire in the portable basket or from the burning of sticks on andirons, however, necessitated the placing of some uninflammable material between the opening and the woodwork, and tiles were found to be most available.

And now comes the next step, the increase of tiling at the expense of the woodwork. Until recent years, good tiles were imported, and even now pattern or stamped tiles (of which the "Minton" is a well-known make) are still brought from England. But American tiles, at a cost scarcely one-half that of the imported, and made in colors both richer and more varied, soon came into common use. The imported tiles are, however, more durable and less likely to craze.

From the facing of tiles between the opening and the woodwork was suggested the lining of the fireplace with the same indestructible material. Hearths were laid not only in front of the mantel but were run into the fireplace, and the sides and back of the opening were covered with tiling. Here arose a new problem, for the walls of tiles, being unequally expanded and contracted by the varying heat of the fire, soon cracked and loosened, and finally came down. Mr. Edwin A. Jackson, who has spent so much study in the improvement of the fireplace, then conceived the idea of riveting each tile to an iron frame, which made their displacement impossible. The cost of this facing, however, made a cheaper lining necessary, and the iron backs now in use were substituted.

The facing within the woodwork was at first but four or six inches in width: now new and rich effects are sought, and the tile-work is becoming the important feature.

The setting of the facings, especially when the areas are large, is a big item in the cost of the fireplace. Not only does it require a great expenditure of time to set up a large facing of these small tiles (they are three inches long, and one, or one-and-one-half inches wide), but it requires skilled and rapid workmen. To secure a plane vertical surface, to have each tile flush with this surface, to have the same amount of plaster between each tile (scarcely more than a film), and to have all the joints break in straight and parallel lines is a result few workmen can attain. To householders of moderate circumstances (whose fireplaces we are considering) it becomes thus a question of a poor job or a small facing.

And here again the need suggested the remedy. *The facings were set on the level, and then put in place.* It was quite common for dealers to "slab" their tiles on marble, that they might be shown to customers. From this to the use of the iron frames already described was but a step, the saving in cost over the old fire linings being in the use of plaster rather than the rivets. Either these processes or modifications of these are used throughout the country in all cases where economy and good results are required.

The advantages in the use of frames are too obvious to need enlarging upon. In this method, the facing is laid out upon the floor, each piece fitted, and the frame welded into shape. The tiles are then placed face downward, the frame put in place, and thin plaster-of-Paris keys the piece. A facing is made in three pieces, and these are put together by the mason who sets them on the chimney breast.

And here we are up to date.

WILL WALTER JACKSON.

A PARTY-LINE QUARREL. — The *Christian Union* gives the following grateful variant upon the ordinary outcome of party-line quarrels: An acquaintance of the *Spectator*, about two years ago, built a house in New York. When the walls were up and the framing of the roof in place he was informed by the man who owned the adjoining property that the new house was six inches on his land. The *Spectator's* friend offered to pay very handsomely for the six inches that had been built upon by mistake. The owner of it would not sell. He said that his plans were all made for occupying the whole of his lot, and for no consideration whatever could he part with the six inches. The *Spectator's* friend could no nothing else than tear down his wall. This was done, and the wall moved back twelve instead of six inches. Then the owner of the neighboring property put up his house, and placed his wall just against that of the finished house. Of course this wall was now on the land of the *Spectator's* friend, who made no remonstrance until his neighbor had finished his house, furnished it, and moved in with his family. Then he called and informed the obdurate man of the fact. He was speechless with rage. The *Spectator's* friend then handed him a deed to the six inches, saying, "I did this just to make you realize how meanly you had acted toward me. I have no wish that you should be put to any expense. I make you a present of that six-inch strip." The *Spectator* is of opinion that if revenge is ever justifiable it was in this instance.

COMPARATIVE MUNICIPAL BUILDING LAWS. — XX.

[*Note:* — In these tables bracketed letters invariably refer to preceding passages in the same column.]

Sidewalks and Space Thereunder.

Boston: —

Baltimore: — All sidewalks to have fall towards curb-stone not to exceed ½″ to 1′. Sidewalk at curb not to be raised more than ½″ above curb. House building or repairing may have enclosure on footway not exceeding 4½′ from building line. Special permit for building vault. (See "*Cellars.*")

Brooklyn: —

Charleston: —

Chicago: — *a*. When space is utilized under sidewalk, a sufficient stone wall shall be built to retain roadway; side, division and party walls shall be extended under sidewalk to such curb wall.

b. Sidewalk shall be of incombustible material entirely, supported by walls or iron beams and columns.

c. Openings for coal and light covered with prismatic lights and in iron frames, or with iron covers having rough surface.

d. No smooth surface on such cover; no plain surface of glass in sidewalk.

e. Permit, with details of construction, required, and owner of property to first give bond of $5,000, approved by City Comptroller.

Cincinnati: — (*a*). *f*. No plain surface of glass or iron greater than 3″ diameter placed in sidewalk.

Cleveland: — (*a*); (*f*).

Denver: — *g*. Vaults under sidewalks shall be securely covered with flagging or arched with hard brick, crown of arch at least 6″ below established sidewalk grade.

h. No fixture shall project above or be sunk below grade of pavement. Outer line of vault must be at least 4′ within inner line of curb, except in business streets; where there is no interference with lamp, tree or public works, they may be built with outer face of wall at inner face of curb.

i. Open areas to be well guarded with iron rails, and their openings perpendicular to street. Areas may be built covered with prismatic iron grating projecting not more than 4′ from street line.

Detroit: —

District of Columbia: — (*g*). Openings in top of vault shall be at inner edge of extreme wall, have suitable covering, to be kept securely closed when not in use.

No fixture shall project above or be sunk below established grade of pavement, and outer wall of vault must be at least 6′ within inner line of curb; except where there is no interference with lamp, tree or public work, by special permit, vault must be built with outer face of wall at inner face of curb.

No vault shall be placed within 3′ of lamp or 4′ of tree, nor so as to interfere with sewer, water or gas pipe, man-hole, tree or any public work.

Proper protection by metal or stone hand-rail shall be provided where steps are over areas or more than four in number, and for all platforms at areas.

Basement and cellar steps to be protected by railing like that for areas, with 4′ openings or gates. (See "*Cellars.*")

Kansas City: — *Coal-hole or vault under sidewalk:* Outer wall next roadway to be of stone, not less than 2′ average thickness, laid in good cement, sides at least 18″ thick, of good, hard brick or stone inlaid in cement mortar, no part projecting beyond curb-stone; top formed of brick arch or arches turned in substantial manner, or by rough-hammered lime or sandstone at least 6″ thick, supported on rolled I-beams of strength to carry 125 pounds per square foot, exclusive of weight of construction.

Opening in sidewalk over vault not more than 20″ diameter, covered with rough iron plate. Entire construction subject to direction and supervision of Superintendent.

j. Coal-slide in sidewalk to have brick walls at least 8″ thick, laid in cement mortar and covered as above.

k. Owner and tenant of estate responsible for safety, maintenance, and prompt repair of above constructions.

No boiler, steam-engine, furnace, steam-pipe, privy or water-closet constructed in coal-hole or vault, nor explosive substance or inflammable oil there stored.

Excavation of sidewalk requires special permit upon written application, and submission of plans and signature to agreement.

One-third width of sidewalk may be used for area to light basement, provided it is covered with prismatic lights in open frame. No open area permitted in sidewalk.

Louisville: — (*a*); (*b*); (*c*). No plain surface of glass in sidewalk.

l. Special permit required after approval of plans by Inspector.

Memphis: — (*a*), (*b*) or by piers. (*c*).

m. No plain surface of glass in sidewalk where any one glass is more than 4″ square.

n. Areas covered with iron or other material shall have sufficient strength for load to which they will be subject. (See "*Cellars.*")

Milwaukee: — (*a*). Curb wall not less than 2′ 6″ thick at base, gradually tapering to not less than 18″ at top, said wall not to be more than 8′ deep below sidewalk grades. (*b*); (*c*); (*d*); (*l*).

No cellar door for mercantile or other establishment shall extend more than 3½′ into sidewalk, and shall be kept securely shut when not in use.

Stairways and steps may be built leading to basement, but not to extend into sidewalk more than 3′ where it is not more than 12′ wide, nor more than 3′ 6″ when sidewalk is wider; said stairways and steps to be protected by iron posts and rails approved by Inspector. Sidewalks must be placed at established grade.

Minneapolis: — (*a*). Curb wall to be stone not less than 2′ thick.

(*b*) in accordance to the following schedule:

Distance in feet between centres.	Weight in pounds per linear foot.	Number and size of beam.	Span in feet.
4 feet centres.	18 pounds.	6 inch No. 10 heavy.	8 feet.
4½ " "	18 "	7 " " 9 light.	9 "
4 " "	18 "	7 " " 9 "	10 "
4½ " "	22 "	8 " " 8 "	11 "
4½ " "	35 "	8 " " 8 heavy.	12 "
4 " "	35 "	8 " " 8 "	13 "
4 " "	33 "	9 " " 6 "	14 "
5 " "	45 "	10 " " 5 "	15 "
4½ " "	45 "	10 " " 5 "	16 "
4 " "	45 "	10 " " 5 "	17 "
5 " "	60 "	12 " " 3 "	18 "
4½ " "	60 "	12 " " 3 "	19 "
4 " "	60 "	12 " " 3 "	20 "

Arches turned between beams of not less than two courses of good, hard brick set on edge laid in cement. (*d*).

No stairway nor open area shall extend into sidewalk more than 4½′ on streets having walks 18′ wide, nor more than 4′ where they are 15′ wide, nor more than 3½′ where they are less than 15′ wide, nor at all where boulevard is less than 3′.

All such stairways and areas shall be properly protected by smooth iron or brass railings, and stairways at street corners rounded to radius not exceeding distance stair projects into sidewalk, measured at right angles to front or side of building.

No staircase shall be built leading from sidewalk or street to any story above first.

Nashville: —

Newark: —

New Orleans: — Banquette shall slope up ½″ to 1′ from established grade at curb.

New York: — (*a*); (*b*) or by piers. (*c*); (*m*); (*n*). (See "*Cellars.*")

Omaha: — (*a*). Curb wall of stone or hard brick. (*b*); (*c*); (*d*); (*l*).

Philadelphia: — It is not permitted, except around areas already excavated, to erect railing so as to reduce footway to less width than 16′ where street is 100′ wide; to less than 14′ where street is 80′; to less than 12′ where street is 60′; to less than 10′ where street is 50′; or to less width than 8′ on narrower streets. No cellar door, porch or steps shall project more than 4½′ into footway of street 50′ wide, or a proportionate distance into narrower street.

Pittsburgh: — Before sidewalk is excavated for building vault, contractor or owner shall erect a good bridge the full width of lot not less than 6′ wide nor more than 4′ high, with steps at end for free use. (See "*Cellars and Projections.*")

Providence: — *Coal-holes and vaults under sidewalk:* Outer wall next roadway not less than 30″ thick, of granite or building stone laid in cement; no part within 2′ of top shall project beyond edge-stone. Sidewalks at least 12″ thick, of hard brick or granite blocks, or 16″ thick of building stone laid in cement-mortar. Top of vault to be good brick arch well turned, or by covering of rough-hammered granite at least 8″ thick, or bluestone at least 6″ thick, or iron and glass similar to Hyatt light, or with rough-surface iron.

Apertures in sidewalk not to exceed 18″ diameter, covered with substantial iron plate with rough surface, or with iron and plate as above specified. (*h*). All above constructions subject to direction and supervision of Inspector or other appointee of Board of Aldermen. (*k*).

St. Louis: — Excavations under sidewalk must not extend beyond line 5′ within and parallel to exterior line of curbing, nor beneath entrance to an alley.

Outer wall to be laid in best hydraulic cement-mortar, and pointed outside for at least 4′ from top; wall not less than 2′ thick for lower 12′, and above tapering to 18″ at top in all cases.

Detail plan and written specifications submitted preliminary to special permit from Board of Public Improvements.

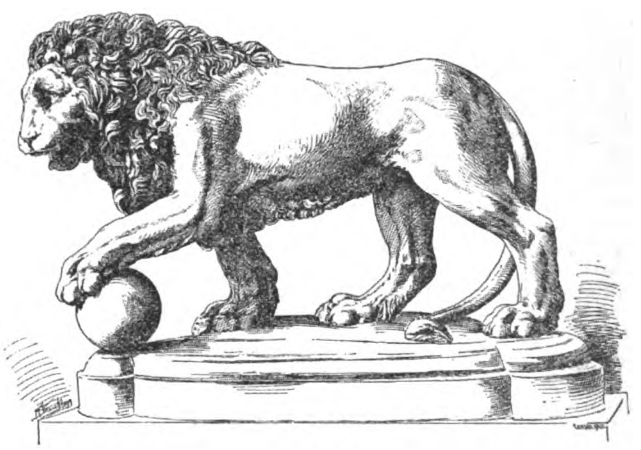
When sidewalk is excavated, person making excavation shall build strong bridge at least 5′ wide, securely railed for convenient passage.

San Francisco: — *Bulkhead and area* walls constructed of brick or stone shall not be less than 12″ thick for height not to exceed 4′, and increased 4″ in thickness for every 4′ or part thereof additional in height; shall have footings not less than three-fourths thickness of wall, with proper provision for drainage. Mortar used for brickwork: hydraulic cement, four parts; quicklime, one part; sharp sand, two parts. Bulkhead or retaining-wall near street line, foundations shall not be less than 4′ below street grade. Bulkhead and retaining-walls shall be constructed in conformity with rules given by Trautwine, or by authors now or hereafter used at United States Academy, West Point.

Wilmington: —

Compiled by Henry A. Phillips.

NOTES ON THE WEIGHT OF CROWDS.[1]



Lion, by Flaminio Vacca: In the Loggia dei Lanzi, Florence. From *Der Formenschatz*.

A DENSE crowd is usually admitted to constitute the heaviest load that is likely to be carried by the floors of churches, theatres, public halls, grand-stands at race-courses and cricket-grounds, and in some cases by bridges. It is also the load under which failure is likely to lead to the most deplorable results, and should, therefore, be most carefully guarded against. Such being the case, it might naturally have been supposed that the weight of a crowd would have been most carefully ascertained, and most generally known and recognized by architects and engineers. Unfortunately, however, the contrary is the truth, and the designer requiring this vitally important information is perplexed and confused by the most contradictory statements appearing in the works of those who ought to be reliable authorities. Some of these statements are given in tabular form below:

Weight of Crowd in lbs. per sq. ft.	Authority.
41	French practice, as quoted by Trautwine and Stoney.
70	Hatfield ("*Transverse Strains,*" p. 80).
84	Mr. Page, engineer to Chelsea Bridge, London, quoted by Trautwine.
100	Maximum load on American highway bridges, according to Waddell's "*General Specifications.*"
120	Mr. Nash, architect of Buckingham Palace, quoted by Trautwine, also Tredgold.
126	Experiment by Mr. W. N. Kernot, at Working Men's College, Melbourne.
143.1	Experiment by Professor W. C. Kernot at Melbourne University.
147.4	Experiment by Mr. B. B. Stoney ("*On Stresses,*" p. 617).

No one can fail to be struck with the extraordinary variation shown in this table, the largest determination of the weight of an ordinary crowd exceeding the smallest in the ratio of nearly 4 to 1. The question then arises, How were these results obtained, and how

[1] Paper read by Professor Kernot before the Victorian Institute of Engineers, October 5, 1892.

is it that respectable authorities have so enormously over or under estimated the correct value?

We will proceed to consider them in detail. The first result is 41 pounds per square foot. This is given on the authority of Trautwine and Stoney, but how it was arrived at I am unable to discover. Trautwine himself puts little confidence in it, remarking that the lives of a dense crowd that once assembled on the Freiburg suspension-bridge, which was built according to this rule, were not very secure. I agree with him, and, further, have no hesitation in denouncing this rule as a most dangerous one, calculated sooner or later to lead to terrible accidents. The second result, 70 pounds, is given by Hatfield, a well-known American author, in a work of considerable pretensions entitled, "*Transverse Strains*," intended for the information of architects. The author discusses the question at length, occupying no less than eight pages of his book with the investigation, quoting numerous authorities and experiments made by himself and others. He commences by severely animadverting upon Tredgold, who in his work on carpentry gives 120 pounds as the true figure, and proceeds elaborately to determine from statistics and also by experiment the average weight of a human being. He then makes the statement that "it is known among military men that a body of infantry closely packed will occupy on the average a space measuring 15 inches by 20 inches = 300 square inches each." Applying this to a crowd, he allows two square feet of surface for each 10-stone man, giving a maximum result of seventy pounds per square foot. The whole investigation, the most elaborate I have met with, is a striking instance of how hopelessly a man may be misled who approaches a subject in a wrong way. To any ordinary reader the question appears to be most exhaustively and scientifically treated, and yet the result is utterly and dangerously in error. The statement as to the space occupied by soldiers quoted above has nothing to do with crowds. In the first case, the men are arranged in a definite order and at a distance sufficient to allow room for knapsacks, weapons, and other accoutrements; in the latter they are forced by violent pressure into closest contact, and are not kept apart by the above-mentioned articles. The fact is, as may easily be proved by any one who can command the services of a dozen persons, that an average man in a crowd occupies a space little, if any, exceeding one square foot. This is the vital fact that Mr. Hatfield is ignorant of, and, though being ignorant of it, he is led most fatally into error.

The third result, eighty-four pounds, is quoted from Trautwine, who says: "The engineers of the Chelsea Bridge, London, packed picked men on the platform of a weigh-bridge, with a result of eighty-four pounds per square foot." How the men were picked is not stated, but in view of our present knowledge of the subject we are justified in saying that if the experiment is not wholly apocryphal, they must have picked the lightest men in the whole of London.

The fourth result, 100 pounds, is given by Waddell, a leading American writer on "*Highway Bridges*," for structures of the highest class in densly populated places; while in country places, where a crowd is very unlikely to assemble, he allows as low a load as fifty pounds. This mode of regarding the subject raises the whole question of possible, but improbable, and certainly infrequent, loading, a question giving the widest field for discussion. I think that some concession may be made in the case of country bridges that would rather modify the safety factor than deliberately understate the maximum possible load. Further, the maximum value for city bridges (100 pounds) is decidedly too low.

The fifth result, 120 pounds per square foot, was originally given by Tredgold, and is severely commented upon by Hatfield as grossly overstated. It is really the first of those on our list worthy of consideration, and is certainly well within the truth. Trautwine further states in a foot-note that "Mr. Nash, architect of Buckingham Palace, wedged men as closely as they could possibly stand upon an area of twenty feet diameter, the last man being lowered from above. Result, 120 pounds per square foot." Here we appear to have the record of a carefully conducted experiment. Still, the result is such as to raise a doubt as to the physique of the men. They must have been rather undersized.

The sixth result, 126 pounds, was obtained by my brother, Mr. W. N. Kernot, at the Working Men's College recently. Thirteen male persons, of from twenty to twenty-five years of age and weighing altogether 1,761 pounds, were without difficulty, and with no unpleasant pressure, caused to occupy a space of only fourteen square feet. There was no "wedging" or lowering the last man by a crane from above. Had such expedients been adopted a considerably higher result would unquestionably have been adopted.

The seventh result, 143 pounds, was obtained by myself about a year and a half ago. A class of sixteen male students, of from eighteen to twenty-three years of age, were individually weighed on a new and very accurate weighing machine; their total weight was 2,455 pounds, or an average of 153.5 each. This is a high average, but the class was of unusually good physique, and their prowess at the tug-of-war, rowing, etc., was well known. This class I placed without the slightest difficulty in a lobby having a floor area of 18.23 square feet by careful measurement, giving 134.7 pounds per square foot. There were, however, considerable vacancies in the crowd, and all agreed that another man, had one been available, could have been put in, thus bringing the result to 143.1 pounds, as stated, which I am convinced is by no means an overstatement of the weight of a moderately dense crowd of strong, well-grown men.

The last result is the most conclusive and valuable of all, from the high reputation of the author, the large scale on which the experiment was tried, and the very complete way in which the result is recorded. I cannot do better than quote Mr. Stoney's own words from his admirable work on "*Stresses*." He says: "I packed fifty-eight Irish laborers, weighing 8,404 pounds, or 145 pounds per man, in the empty deckhouse of a ship 9 feet 6 inches by 6 feet = 57 square feet. This gives a load of 147.4 pounds, or a little more than one man per square foot; and some years later I placed seventy-three Irish laborers, weighing 10,948 pounds, or 150 pounds per man, into a wooden hut 9 feet 8 inches by 8 feet = 77 square feet; this gives a load of 142 pounds per square foot, or a little less than before. I have reason to suppose, however, that in this latter experiment two or three more men could have been squeezed into the hut, in which case the load per square foot would have been nearly the same as before."

In conclusion, I would desire to insist upon the fact that a dense crowd of well-grown men is proved by Stoney's experiments, corroborated by my own, to weigh from 140 to 150 pounds per square foot of surface covered, and that the results given in many standard works of from 40 to 100 pounds are seriously and dangerously understated.

EFFECT OF A FIRE ON A CHICAGO BUILDING OF FIRE-PROOF CONSTRUCTION.

Entrance to House of B. H. Warder, Esq., Washington, D. C. H. H. Richardson, Architect.

THE practical and severe fire-test of the nine-story fireproof building of the Chicago Athletic Club, which building is of steel-frame construction now so generally used, was noted in our issue of November 10, and, as was then stated, it successfully stood the test. This system of construction was fully described in *Engineering News* for December 5, 12 and 26, 1891, and January 2 and 9, 1892. We are indebted to Mr. E. S. Pike, chairman of the building-committee of the Chicago Athletic Association, for reports made upon the effects of the fire by Gen. Wm. Sooysmith and Mr. Isham Randolph, both well-known engineers. We give below the main facts of these reports, by which it will be seen that special care should be taken to securely attach the fireproof tiling, etc., to the columns and walls. The joint report just made by the engineers mentioned is as follows:

"It is evident that the building when it took fire contained a very large quantity of combustible materials. There was a great deal of scaffolding and wood-finishing material distributed throughout the building, particularly in the gymnasium. If the building had been completed it would never have contained combustible material enough to have produced heat enough to have done any considerable injury to the building by burning. The heat of the fire that has occurred was evidently intense, as some of the steel beams, where they were not as yet fireproofed, are badly bent by expansion where their ends were confined.

"We have nowhere discovered that the metal portions of the building where the fireproofing held have been deformed or injured. And even where the fireproofing tile dropped off, from the burning out of the nailing strips which supported them, the columns seem to have supported their loads without bending, except two on the eighth floor, owing, no doubt, to the fact that the greatest heat had been

expended before these strips were so burnt away as to permit the tile covering to drop off. This building furnishes an assurance that was lacking before — that the metal parts of a building, if thoroughly protected by fireproofing properly put on, will safely withstand any ordinary conflagration if the quantity of combustible materials the building contains is not greatly in excess of that which enters into the construction of the building itself. In this instance we do not think that the fireproofing was properly bonded. We found the exterior walls and floors intact, and only the ornamental parts and the caps, sills and casings of the windows badly cracked and spalled. The integrity of the building does not seem to be impaired, and it may be made as good as new by replacing the parts injured."

Mr. Randolph also submitted the following notes made by him as the result of his examination of the building, the examination being made independently of that made by General Sooysmith, but both being made at the same time:

"One very self-evident result of my investigations is the fact that better methods of bonding the fireproofing materials around the columns will have to be resorted to, if all the benefit of fireproofing is to be secured. No doubt exists in my mind that in the instance before us the fireproofing around the columns saved them from an utter collapse, by remaining in place until the fuel which fed the flames was wellnigh exhausted; but that was a fortunate accident, and not a result assured by the method of construction. It seems like a presumption upon the possible carelessness of others to venture the suggestion that before any work of reconstruction is permitted to be done that the débris should be entirely cleared away, so that a critical examination of every detail of the construction can be made and every part known to be safe before it is hidden by new construction.

"Ninth Floor.—But little damaged. Plastering peeled off walls of northwest corner room. Elevator shaft damaged.

"Eighth Floor.—Gutted east of the west 45 feet. In the front room the hollow tile fell away from the wrought-iron columns and they show signs of severe punishment. The east and west columns of the south row of three in the front room are decidedly out of vertical and the middle column badly warped.

"Seventh Floor.—Badly wrecked, but damage confined to burning-out of casements and peeling-off of plastering, and destruction of a few thin partitions. I note that in the northeast corner room, next to the stairway space, where the partition between the room and the stair hatchway had fallen in, one or more cans containing gasoline were found in good condition. The men who found them removed or secreted them very promptly.

"Sixth Floor.—Completely gutted of doors, windows, window-casings, and plastering. The I-beam supporting the wall between the northeast corner room and the stair area is bulged westward, and the wall above in a tottering condition. I-beams over light-areas badly warped and buckled.

"Fifth Floor.—Gallery, or race-track, around gymnasium, badly wrecked. Gymnasium, or fifth floor, gutted. The fireproofing of the columns failed completely, owing largely to the very faulty method of girding the column at intervals of about 3 feet, 4 inches with wood, separating the successive length of fireproofing tiles by material destructible by fire. These wooden girdings charred out and let the tiles fall, leaving the column with no protection from the heat. I fail to discover any warping or other deformation of these columns. None of the floors show any sign of weakness other than the falling away of an occasional tile from the ceilings.

"Fourth Floor.—The east front rooms on this floor escaped all damage from the fire, but are damaged by water. The rest of the floor suffered from fire, the woodwork being destroyed; but, so far as I can see, it is not impaired in point of stability. Below this floor I could see no fire-damage, and whatever damage there is, I judge it due to water.

"Michigan Ave. Front.—Above the gymnasium it is badly defaced, the stone used in its construction having scaled badly.

"Exterior Walls.—Apart from the damage noted above to the Michigan Avenue front, the main or exterior walls seem to be in excellent condition. No displacement or bulging is evident to the unaided eye. There seems no reason for questioning the integrity and strength of the building in its entirety after such renewals of damaged material as can readily be made have been effected."

Mr. Pike considers that, while a part of the fireproofing was ruined, it would not have been ruined had not the firemen thrown water on it when it was thoroughly heated, his claim being that the water was unnecessary, as the fire had done all the damage possible before the water was thrown on. The fireproofing, however, should be so put on as to stand the application of water without falling off, as it is most likely to be subjected to such treatment in case of fire. But it is not fair to lay the responsibility upon the firemen, whose first aim and duty is naturally to direct water into a burning building to extinguish the fire and prevent it from spreading, without considering what incidental damage it may do. — *Engineering News.*

Incendiarism Thirty Miles Away. — How grave a danger electric wires involve is demonstrated by the discovery that a recent fire in Chenango County was caused by the crossing of an electric-light wire with a telephone wire thirty miles away. It is not at all surprising that the use of the trolley on Manhattan Island is to be speedily followed by an advance in insurance rates. The insurance men deal with facts, and recognize one fraught with danger as soon as they see it. — *N. Y. Tribune.*

UNPROFESSIONAL PRACTICES.

Cradle of the Duc de Bordeaux, in the Garde-Meuble, Paris. From *L'Art pour Tous.*

In the so-called "learned" professions there are certain rules of professional etiquette observed, especially in the law; any interference with the acknowledged rights and duties of one solicitor or barrister by another is sternly rebuked; but amongst architects there appears to be a very lax conduct in dealings with one another. A code of professional ethics has been often talked about, but no definite rules have been framed binding on the whole profession, albeit without this general agreement very little can be accomplished in this direction; in fact, we scarcely can hope to look for any such amelioration till the profession of architecture becomes a registered body amenable to statutory powers. There are many practices which daily take place among architects and surveyors which are certainly wanting in professional conduct, or that can be said to be decorous. One of the commonest customs is that of touting for work. In the provincial town, especially, the custom prevails to so large an extent that few people are inclined to take much notice of it. Mr. James Smith, a wealthy tradesman and town councillor, is about to build a residence, and as soon as the rumor is afloat he is besieged by several of the architects of the town, who are bent on the same errand of soliciting employment. Though it may be well known that the said Smith has consulted an architect who has even prepared designs, such information has no effect in the least on the canvassing proclivities of A, B, and C, who individually are eager to show their own superiority in professional skill, and even to vie with each other in detracting from the abilities of the other two, sometimes going so far as to blacken one another's character. Each sends a number of drawings of buildings, or goes so far as to prepare designs on approval, till Smith, wearied by these importunities, refuses to have any more interviews, or to see any more designs. We can understand a fair solicitation by sending a professional card when the contemplating building owner has not quite made up his mind; but the practice of touting after an architect has been engaged is most reprehensible and quite unprofessional. We know of all kinds of things having been said and done by touts of this class to win the confidence of clients as well as committees. We are well aware that in the excitement and rivalry of competitions some excuse may be found, but the most unwarrantable assertions are made, which in no other profession would be tolerated. A, B, and C are competitors in the same town for a public building, whose designs are both well spoken of. A obtains an interview with one or more of the committee or town council, and does not scruple to misrepresent B, or to pick holes in his plan; while C goes so far as to print and circulate information to the detriment of the favored design. We cannot find fault with the competitor who, when he has the opportunity, points out the merits of his own design and criticises the plans of others; but this sort of thing may become something worse than bad

taste. When plans are under motto or number individual criticism cannot do any harm, and must do some good in drawing attention to points of arrangement; but these disparaging remarks are often carried beyond the bounds of fair criticism. We protest certainly against the habit of some members of the profession who seek to prejudice the minds of committee and assessor while the plans are being discussed, and we think that such conduct is deserving of severe censure. After a decision has been made every one has a right to say what he thinks of the design; it then becomes public property. Architectural competition has, indeed, furnished many glaring examples of the need for a standard of professional ethics or conduct in matters of this kind. The most unparliamentary tactics have been resorted to, such as disclosing names, the private circulation of mottoes, correspondence in local papers, publication of private circulars, and other methods of influencing the minds of committees and the public. These are methods that ought to disqualify any one who resorts to them. The practice of calling on members of committees in such cases is wanting in common respect and etiquette, and no individual who has any regard for his profession would condescend to do such a thing.

There are other practices which are equally culpable and unprofessional, and we notice a few of them here in the order they occur to us. It has been our unpleasant duty of late to record several instances of touting or advertising by so-called architects, in the remembrance of many readers. In those undignified announcements we often find the profession of architect associated with all kinds of trades and callings, such as those of builders, undertakers, auctioneers, house-agents, and even public-house businesses. These advertisements are not only detrimental to their authors but injurious to the profession, and cause it to be held in disrepute. The public at once draw inferences as to the status of those who thus tout, and unpleasant comparisons are made damaging to the profession. Quacks and mountebanks there always will be, but let the representative bodies of the profession try and stop a practice that has done incalculable harm to the calling.

A more reprehensible practice even than touting for business, because it involves the honorable conduct of architects, surveyors, and engineers, is that of interfering with or going between a brother architect and his client. We have known of cases where an architect or surveyor has been consulted or called in by a client who has disagreed with his own architect about granting certificates or the performance of work. We are not alluding to the case of a properly appointed arbitrator under the terms of a contract, but to an irregular invitation made by the client or the builder. In a properly drawn-up contract such an irregular interference would be impossible as that of the following case: An architect declines to give a certificate of completion, whereupon the builder consults Mr. Bouncer, who writes a letter to the official architect asking for a meeting at the building to measure up and value the work executed. Of course the latter can decline to meet the builder's nominee, who has the questionable taste to interfere with a brother-architect's work. It is an unwritten law in the ethics of every profession that it is unprofessional and wrong to accept any consultation in a work or business in which another member of the profession is employed without invitation to do so from the latter. Yet we sometimes find an architect accepting an offer to pass an adverse opinion on his brother-professional's work, or even going out of his way to give advice prejudicial to the appointed architect. The effect of such criticism or advice is to imply a doubt as to the ability of the architect or engineer engaged without giving the latter an opportunity of explaining his mode of operation or of rebutting the advice. It is very easy to criticise. One may say, "I should have made the plan so and so," or point out a better or safer mode of construction of a roof than that adopted, without knowing the circumstances of the actual requirements with which the architect has had to comply. How often we hear of the architect's sanitary arrangements questioned by another of the same cloth — perhaps a trivial question of trapping or of ventilation magnified into an importance it scarcely deserves. The architect in charge has a right to be first heard, and to accept or refuse the client's wish to call in an expert. If he refuses, the employer can only ask him to resign. No other course would be fair. The duty of the expert called in is clear — he should consult the architect before making any report.

A flagrant breach of professional etiquette is often noticed in the courts of law. Professional witnesses are found ready to give any evidence against their brother architect as to questions of fees or of negligence. This is the more glaring when their evidence is made to prejudice the jury, or by giving answers upon insufficient knowledge of the facts. Many other instances of unprofessional conduct might be cited, if only we had the space; but those we have instanced are enough to show to what extent unprofessional dealings are carried on. An American contemporary has prepared a short code of ethics to meet these practices. The rules given are good as far as they go, but the difficulty in the way is the general acceptance of them by the profession as a body. The main societies and their affiliated branches should certainly use their influence to prevent these practices amongst their members. The rules of membership generally include restrictions as to certain kinds of practice; but our experience is that the transgressors in these instances of malpractices are not entirely confined to non-members of professional societies. — *The Building News.*

SOCIETIES

THE ART-WORKERS' GUILD.

THE annual general meeting of the Art-Workers' Guild, Philadelphia, was held on December 30, in the studio of Mr. Alfred Godwin, 1325 Market Street, Philadelphia. The business, being chiefly the election of officers and committee for the ensuing year, resulted in the unanimous return of the following gentlemen to a second term of office:

Ed. Hazlehurst, *Master;* H. Bloomfield Bare, *Secretary*; Edward Lee Young, *Treasurer;* and for *Committee*, H. T. Cariss, P. Moran, W. A. Porter, V. E. Rondel, J. B. Sword and Henry Thouron.

Mr. C. M. Burns and Mr. Alfred Godwin, the elected auditors, reported favorably upon the treasurer's accounts and upon the financial position of the Guild.

The Master, Ed. Hazlehurst, proceeded to remind the members of the satisfactory progress that had been made notwithstanding the very short period since the formation of the Society, which had sprung out of a suggestion made in April, 1892, to a few members of the Philadelphia Art Club as to "the propriety of forming in Philadelphia a Guild of Art Workers, so that some united effort of practical work may be combined with sympathetic social intercourse, and an attempt be made to break up the isolated life of Art Craftsmen, and to uphold the spirit of Art Unity."

Those eligible for election in the Guild should be practical workers in any of the arts and crafts, as for instance architects, decorators, designers, engravers, etchers, glass-painters, goldsmiths, lithographers, metal-workers, modellers, mosaic-workers, painters, potters, process-printers, sculptors, wood-carvers, and representatives of other branches of art work.

Similar societies in England were started in London, 1884, and in Liverpool, 1888, and this is probably the first association of the kind in the United States.

The regular meetings of the Guild are held monthly during nine months of the year, with practical exhibitions of various crafts, and discussions thereon by the members. Intermediate meetings are also arranged for business of a less formal character.

The rules provide for two classes of members. "'Guildsmen' are defined as 'Handicraftsmen and Designers in the Arts'; 'Associates' may be those persons whose nomination the Committee may approve; they shall have all the privileges of membership, except that of voting."

The Guild now numbers forty-four members, with other candidates on the list for election.

A dinner was given at the Art Club in May, at which the newly organized association entertained Mr. Walter Crane, a Past-Master of the London Art-Workers' Guild, then present in Philadelphia with an exhibition of his works in the gallery of the club. A more fitting inauguration could hardly have been made, for the great variety and high excellence of the works in this exhibition displayed at their best almost every branch of the arts and handicrafts in which this association is especially interested.

The growing needs of the Guild require that its meetings should be held in permanent rooms, and a committee appointed for the purpose report that suitable premises will, it is expected, be ready for occupancy within the next few weeks, when a syllabus of meetings for the year and the subjects offered for discussion and illustration by the members would be issued. Feeling reference was made by the Master to the death of Prof. F. Rondel, a member whose loss was deeply felt by all "on account of his many genial qualities, his right-minded counsels, and ever-active and generous support in all affairs touching the interests of his brother artists of every degree."

At the conclusion of the formal business the meeting partook of a more sociable character and indulged in the discussion of a variety of interesting subjects which suggested themes for illustration for many future evenings.

WORCESTER COUNTY SOCIETY OF CIVIL ENGINEERS.

THE regular monthly meeting of the Worcester County Society of Civil Engineers was held at Wood & Rugg's office last week. The following officers were elected for the ensuing year:

President, A. J. Marble; *Vice-President,* E. W. Shedd; *Secretary,* W. E. Hasson; *Treasurer,* A. W. Woods; *Executive Committee,* G. E. Wetherbee, E. K. Hill, W. E. Mills.

A committee consisting of W. H. Moulton, F. L. Allen, and M. A. Boyden was appointed to arrange for the annual banquet, at which the Worcester Chapter of the American Institute of Architects will be asked to unite with them.

SKETCH CLUB OF NEW YORK. — MONTHLY MEETING.

THE regular monthly meeting of the Sketch Club was held at the rooms of the Club, No. 47 West 42d Street, Saturday evening, January 7, 1893.

Forty-six members and four guests were present. Mr. John La Farge, the guest of the evening, gave the history of the decorations

of Trinity Church, Boston, which was very much enjoyed by all present.

At the conclusion of Mr. LaFarge's talk, the criticism on the Park Vase competition, by Mr. Frank Freeman, was read. Mr. B. Hustace Simonson received first mention, and Mr. Harason Bleckley second.

Fourteen drawings were submitted in the Hillside Tomb competition for January.

Mr. Charles F. Miller, of the J. M. Cornell Iron Works, has offered prizes to the Club of $35 and $15 for a design of a country house, plans to be furnished. Perspective outline drawing to be submitted only, designer can send in others if he chooses. Mr. Miller will make arrangements with the successful man to carry out the work.

Mr. James Ackerman offered a prize of a box of instruments valued at $20 to the members of Mr. Kirby's pen-and-ink class for the best design and rendering of a stone panel.

The following class nights were announced for January:

Water-color, January 12, instructor, Clarence S. Luce; construction, January 20, instructor, Chas. T. Miller; pen-and-ink, January 27, instructor, Henry P. Kirby. J. N. Hutchins,
Recording Secretary.

Illustrations

[*Contributors are requested to send with their drawings full and adequate descriptions of the buildings, including a statement of cost.*]

HOUSE OF MRS. J. C. COONLEY, DIVISION STREET AND LAKE SHORE DRIVE, CHICAGO, ILL. MESSRS. POND & POND, ARCHITECTS, CHICAGO, ILL.

[Gelatine Print issued with the International and Imperial Editions only.]

COMPETITIVE DESIGN FOR THE MANHATTAN LIFE INSURANCE BUILDING, NEW YORK, N. Y. MR. STEPHEN D. HATCH, ARCHITECT, NEW YORK, N. Y.

COMPETITIVE DESIGN FOR THE BANK OF COMMERCE BUILDING, BUFFALO, N. Y. MESSRS. SHEPLEY, RUTAN & COOLIDGE, ARCHITECTS, BOSTON, MASS.

MARKET AND ARMORY, PORTSMOUTH, VA. MESSRS. CARPENTER & PEEBLES, ARCHITECTS, NORFOLK, VA.

PROPOSED NATIONAL GUARD ARMORY, SAN FRANCISCO, CAL. MESSRS. W. G. & C. R. MITCHELL, ARCHITECTS, SAN FRANCISCO, CAL.

ARMORY FOR THE SAVANNAH VOLUNTEER GUARDS, SAVANNAH, GA. MR. W. G. PRESTON, ARCHITECT, BOSTON, MASS.

PRESBYTERIAN CHURCH, MANSFIELD, PA. MR. W. J. EAST, ARCHITECT, PITTSBURGH, PA.

[Additional Illustrations in the International Edition.]

TOMB OF AUGUST BELMONT, NEWPORT, R. I. MR. R. M. HUNT, ARCHITECT, NEW YORK, N. Y.

[Gelatine Print.]

REAR VIEW OF THE SAME.

[Gelatine Print.]

TOMB OF ANN MARIA SMITH, NEWPORT, R. I. MR. STANFORD WHITE, ARCHITECT AND MR. LOUIS ST. GAUDENS, SCULPTOR.

[Gelatine Print.]

FOX OAK, BURHILL, NEAR WEYBRIDGE, ENG. MR. HALSEY RICARDO, ARCHITECT.

CHURCH OF S. MARIA DI CASTELLO, CORNETO. DRAWN BY MR. J. A. SLATER.

A CHURCH AT CORNETO. DRAWN BY MR. J. A. SLATER.

SUMMER RESIDENCE AT POINT LONSDALE. MR. ALAN C. WALKER, A. R. I. B. A., ARCHITECT, MELBOURNE, AUSTRALIA.

This house has been erected at Point Lonsdale, near the entrance to Port Phillip Bay. It commands a splendid view of what is known as the "Rip," where the cross currents of Bass Straits meet. The house contains sixteen rooms, exclusive of bath-rooms, stores, etc. A leading feature has been made of the main gable with two large bay-windows carried up the whole height. The veranda, 12 feet wide, has been carried round three sides, and there is an uninterrupted walk of 160 feet. At the angle it has been brought out to an octagon to form a piazza. The building is of wood, with slate roofs and shingles on the veranda roofs.

DESIGN FOR VILLAS, MOUNT MARTHA ESTATE. MR. ALAN C. WALKER, ARCHITECT.

The second design which we publish also suggests some of the characteristics, and especially the veranda, which are considered to be requisite for all classes of Australian residences.

Communications

[*The editors cannot pay attention to demands of correspondents who forget to give their names and addresses as guaranty of good faith; nor do they hold themselves responsible for opinions expressed by their correspondents.*]

THE SALTPETERING OF BRICKWORK.

New Orleans, December 9, 1892.

To the Editors of the American Architect:—

Dear Sirs,—I enclose translation of some extracts from a work, "*De l'Humidite dans les Constructions,*" by G. Philippe, civil engineer, published by Ducher & Cie, Paris, 1882. I had, even previous to seeing the above book, formed the opinion that the growing dampness in old walls is formed by the deposition, or formation by deposits from the air, of saltpetre, which, travelling down in the porous wall until arrested by the usual waterproof damp-course, gradually accumulates in the wall, where, as it absorbs more moisture than the materials of the wall, the damp lime continually rises; thus laying open to question the effectiveness or even advisibility of the damp-course (waterproof course for the prevention of dampness). If the saltpetre is deposited or formed as above, the above theory appears more reasonable than that a wall which has first lost, by evaporation or otherwise, its water of construction should subsequently "suck up" water from the ground, except in places where the surroundings are favorable to the absorption of deliquescent salts, which would then grow upward instead of building from above. I mentioned the subject to a prominent chemist here, who asserts that saltpetre can neither be deposited from the air, nor formed in the wall by deposits from the air, thus directly contradicting the authorities cited by Mr. G. Philippe.

As this is a question of vast importance to the profession, especially in damp and foggy climates, I would be pleased to have you submit the question to one or more chemists who may have turned their attention in that direction, as also to the profession at large.

If the saltpetre is received or formed from the air, a furred interior wall should not increase in dampness, as the moisture and its impurities are intercepted by the detached plastering, which, moreover, from following more readily the changes of temperature, would absorb less moisture. If, instead, the saltpetre comes from the ground, the dampness in the wall ought to grow, perhaps faster in a furred than in an unfurred wall; because the furring, by retarding the evaporation in the wall, might assist its rise. In the first case the waterproof course would assist the accumulation of saltpetre; in the other prevent it. As my doubts are but of recent date, I have to confess that I have not given this paragraph a close study, which can be made only as opportunity presents.

Yours truly, Jas. Freret.

EXTRACTS FROM "*De l'Humidité dans les Constructions.*" G. PHILIPPE, CIVIL ENGINEER, PARIS, 1882.

Page 24 and following:

"Saltpetre is found in the walls.

"Boussingault found one to three milligrams nitic acid per litre in rain-water; and in a thick fog in Paris, December 18, 1857, as much as ten milligrams per litre. Liebig has established the presence of nitrate of ammonia in storm rains. M. Cloez placed in a flask pieces of brick soaked in carbonate of potash and soda, on which he passed air; on continuing the experiment long enough, there were formed alcaline nitrates; if the brick was replaced by an inert body containing no oxidable substance the result was negative.

"Kuhlman, chemist, has shown that, under the influence of a porous body, ammonia was oxidized in contact with air; the experiment was as follows: A flask contained ammonia which was heated over an alcohol lamp; the gas liberated was brought into another flask, with three mouths, into which a current of air was also driven rapidly. The mixture of gas and air passed by the third mouth on platinum moss slightly heated; very soon the moss became heated to a red, and from the extremity of the tube white vapors escaped, which condensation showed to be nitrate of ammonia.

"We will note that the same chemical combination is produced cold, provided the catalytic action of the porous body can take place; only it is produced slower. In nature, the ammonia is furnished by the fermentation of animal and vegetable detritus, urines, fecal matters, etc.; the building materials constitute the porous body; the acid in the nascent state seizes on the lime or potash contained in the clays, and saltpetre is formed."

A DISPUTED COMMISSION.

Boston, December 21, 1892.

To the Editors of the American Architect:—

Dear Sirs,—Will you greatly oblige us by giving us an opinion on the following case?

Some time ago a building-committee in a distant State advertised the terms of a competition for a parish church. The limit of cost was fixed at a certain sum. The award was given to this firm and one of the members visited the place in order to become acquainted with the conditions, etc. While there he was informed that the

committee had grave doubts as to the possibility of executing the accepted plans for the sum specified. They, therefore, furnished him with the names of certain local builders. He consulted with these men and obtained from them approximate figures which ranged from ten thousand dollars more than the limit to over double the sum. These figures he submitted to the committee, and on the basis of these figures we were ordered to prepare the working-drawings, our representative stating that if the lowest approximate figure was reliable it would be perfectly possible to reduce the cost of the plans by ten thousand dollars.

We immediately began work on the plans, and had them well under way when, becoming convinced that the final estimates could only be largely in excess of the lowest approximate figure, we, with the consent of the committee, still further modified the plans, and prepared an entirely new set at our own expense.

These plans and specifications (½ scale, complete) were sent to the committee, who obtained figures on them, the result being that the lowest received was practically the same as the *highest* approximate.

The committee write back refusing to honor our bill, for 2½ per cent sent with the plans and specifications; declare that the plans are of no use to them; that they hold them subject to our order, and demand indemnity for the loss they have sustained.

Subsequently they modify their demands, and propose that we make another full set of plans and specifications which they would accept, *provided* they are satisfactory to the committee and could be built within the specified sum. This we decline to do, and in reply are informed that the committee has decided to employ other architects, and will under no circumstances pay us anything for the very large amount of work already done.

It is our impression that, as approximate estimates were obtained from men selected by the committee, and that as we were authorized to prepare plans on the basis of their figures, the responsibility rests with the committee, but we should very much like your opinion of the matter. Very truly yours, ARCHITECTS.

[WE could hardly answer this question, and we imagine a jury would be equally unable to answer it, without a long and exhaustive investigation and all the circumstances attending the making of approximate estimates. If the drawings submitted for approximate estimate were so clear that a builder of reasonable skill ought not to make any serious mistake as to what they meant, and if the estimates were made for the committee, by the committee's men, and without interference from the architects, we should say that the committee ought to stand strictly by its action; but if the committee has any good reason to suppose that it, or its men, were misled by the architects, or their drawings, it might fairly consider itself discharged from its obligation; and a jury, from the fact that the actual estimates were more than a hundred per cent higher than the approximate ones, would probably jump to the conclusion that there must have been some deception on the part of the architects. The controversy is certainly a most unfortunate one. According to the statement in the letter, which appears to put the case very fairly, there does not seem to have been any bad faith on either side, and the whole trouble has the air of being due to a series of misunderstandings. The late H. H. Richardson used to say that he would never allow a set of plans to leave his office unless he went with them; and we cannot help thinking that if one of the architects had accompanied the working-drawings the trouble might have been avoided. — EDS. AMERICAN ARCHITECT.]

THE LATE ADRIAN WORTHINGTON SMITH.

PHILADELPHIA, PA., December 30, 1892.

TO THE EDITORS OF THE AMERICAN ARCHITECT:—

Dear Sirs, — Adrian W. Smith, architect, died on the 18th inst., at the age of thirty-two years.

His efforts were principally in the direction of ecclesiastical works, and though cut off in the beginning of his career his influence as an earnest advocate of radical methods of advancing the practice of architecture to higher ethical planes will long be felt by his fellow-practitioners. Very respectfully yours,

AMOS J. BOYDEN, *Secretary, pro tem,*
Philadelphia Chapter, A. I. A.

DEFECTIVE FLUES.

NEW YORK, January 9, 1893.

TO THE EDITORS OF THE AMERICAN ARCHITECT:—

Dear Sirs,—It is with much interest we note your comments on "Defective Flues," and it being a subject of so great importance to us, we cannot but offer a few suggestions.

First, Avoid all sharp turns or any runs that bring the flue below an angle of sixty degrees. Probably in nine cases out of ten, where trouble has arisen from open joints, it can be traced to one of these turns. A straight wall can be so easily laid, and there is so little cause for mortar to fall from joints, that safety is insured even with careless mason-work And on the contrary, the most careful work will not always insure safety in a horizontal run. And not only are these turns dangerous, but they are disastrous to the draught of the fireplace. For every reason, they should be avoided.

Second, Do not place woodwork on the chimney-breast or near the fireplace. To do this is in direct violation of the building laws — yet it is repeatedly called for by unthinking architects. Plaster should be put directly on the brickwork. Besides adding to the safety, this materially increases the amount of heat radiated from the flue into the room through which the flue passes.

It is surprising how many careless mistakes builders will make; and architects are not sufficiently strict on the construction of fireplaces. Even where drawings and specifications show the desired construction, and mistakes are cautioned against, we have found timbers run directly under the fireplace, and in some cases directly over. It is not uncommon to find a staircase supported by the chimney-breast, and wood mantels come in close contact with the fire.

Inasmuch as a fireplace is at once the most attractive and, if poorly constructed, the most dangerous feature of a house, would it not pay architects to make a special study of this subject?

We are very truly yours, EDWIN A. JACKSON & BRO.

NOTES AND CLIPPINGS

THE RIGHT TO MAINTAIN PRIVATE BURIAL-GROUNDS. — Several interesting cases as to burial-places have been decided within a month or two. The Second Division of the Court of Appeals, just before it disbanded, discussed the rights of the parties to the suit in a case where a farm was sold with a reservation of the right of burial in a private burying-ground on the farm and a right-of-way to the graveyard. Subsequent holders of the farm endeavored to destroy the burial-place by removing the stones and levelling the ground. The Court held that the descendants of those who originally sold the farm could prevent the destruction of the burying-place, as the right to bury includes the right to protect the graves from those who would destroy them. A case in a Philadelphia local court a few months ago was to the effect that a widower who desired to remove the dead body of his wife from one cemetery to another could not be prevented from doing so unless good cause was shown. The wife was a Roman Catholic, and, at the request of her relatives, was first buried in a Roman Catholic cemetery. Afterward, the husband desired to remove the body to a Protestant cemetery, but the sister of the wife endeavored to prevent the change. The courts would not interfere. A correspondent of the *London Justice of the Peace* writes to know whether the taking of flowers from the grave on which they had been placed and transferring them to another grave without the consent of the person who owned the flowers is larceny. The law journal, referring to a previous decision, holds that the transfer would be larceny. It was held in a recent case in the Pennsylvania Supreme Court that the right to sepulture in a cemetery is not such an interest in the land as will support an action in ejectment. — *N. Y. Tribune.*

NINE HOURS' WORK FOR TEN HOURS' PAY. — "Have you ever realized?" said a business man yesterday, "what nine hours' work for ten hours' pay means?" Supposing a factory employ fifty hands at two dollars a day, which is twenty dollars an hour for ten hours' work. Therefore, nine hours' work means giving each man twenty cents a day, the fifty men ten dollars a day, or three thousand dollars for the three hundred working days in a year. But that is not all. In order to turn out the same amount of output, the manufacturer must make up this one hour by hiring one new man for every nine men, or five new men for the fifty men. The five new men, at two dollars a day, cost ten dollars a day, or another three thousand dollars for the three hundred working days, a total of six thousand dollars, or twelve per cent extra cost on an output of fifty thousand dollars. If the manufacturer does not make up the lost time by hiring the new men his pay-roll has, nevertheless, increased three thousand dollars a year, while his output will have decreased ten per cent because of the one hour in every ten granted the men. It means again additional space or additional machinery for the five new men, which represents another three per cent., at least. Thus you see that the demand for ten hours' pay for nine hours' work, which looks so innocent on its face, amounts to fifteen per cent extra expense on the cost of the goods, when the average profit is only about six per cent. Therefore, except this is made a universal rule everywhere, any manufacturer granting it will simply be wiped out by the competition, having this fifteen per cent disadvantage."— *Cincinnati Commercial Gazette.*

PESTILENTIAL CHURCHES. — The Church of St. Mary Woolnoth, which stands out conspicuously at the King-William-Street corner of Lombard Street, London, was closed ten months ago, and it is clear from the statements of the rector that the step was not premature. It has been his unhappy lot to be often startled in the course of his services by a loud yet muffled sound, evidently issuing from the vaults under the church. As these vaults are now "hermetically sealed," the phenomenon may well have excited the imaginations of timid members of the congregation. Mr. Brooke, however, recognized the noises only too well. They were caused by the falling of leaden coffins, sometimes from a height of ten or twelve feet, in consequence of the mouldering away of the coffins of oak and elm on which they had been piled. It would be well if the evils of this relic of our barbarous system of intramural interment had ended here. Unfortunately the process of "hermetically sealing," according to Mr. Brooke's evidence before the Consistory Court of St. Paul's Cathedral, has been anything but "hermetical." Mr. Brooke declares that for years nearly every official has died from the effects, direct or indirect, of the unendurable smell. Mr. Arthur Statham, the council representing the parish, stated that 1,681 adults and 422 children had been deposited in this horrible receptacle between 1700 and 1832. In the latter year, according to Mr. Statham, the vault was closed for burials; but these burials in St. Mary Woolnoth, if burials they can be called, were continued for at least twelve years after the latter date. The question appears now to resolve itself into that of apportioning the cost of removing these human remains. Clearly a decision should be come to without a moment's unnecessary delay.— *London Daily News.*

Ruins of the Temple of Baal. — There rises a huge wall, seventy-five feet high, enclosing a square court, of which the side is 470 feet long. Part of the wall, having fallen into ruins, has been rebuilt from the ancient materials, but the whole of the north side, with its beautiful pilasters, is perfect. As the visitors enter the court they stand still in astonishment at the extraordinary sight which meets their eyes, for here, crowded within those four walls, is the native village of Tadmor. It was natural enough for the Arabs to build their mud huts within these ready-made fortifications, but the impression produced by such a a village in such a place is indescribably strange. The temple, so to speak, is eaten out at the core, and little but the shell remains. But here and there a fluted Corinthian column or group of columns, with entablature still perfect, rises in stately grace far over the wretched huts, the rich, creamy color of the limestone and the beautiful mouldings of the capitals contrasting with the clear blue of the cloudless sky. The best view of the whole is to be obtained from the roof of the naos, which, once beautiful, and adorned with sculpture, is now all battered and defaced, and has been metamorphosed into a squalid little mosque. To describe the view from that roof were indeed a hopeless task. High into the clear blue air and the golden sunshine rise the stately columns; crowded and jumbled and heaped together below, untouched by the gladdening sunbeams, unrefreshed by the pure, free air, lie all the squalor and wretchedness of an Arab mud-hut village. — *Blackwood's Magazine.*

Safety-valves on Range-Boilers. — In reference to our recent article on range-boiler explosions, Mr. Kinnell, of the firm of C. P. Kinnell & Co., writes to us in a very dictatorial style to the effect that we have misled the public by stating that safety-valves on boilers will afford security from explosion, and denying that they will; his reason being that in the case of a red-hot empty boiler into which water is introduced the pressure of steam is too sudden and violent to allow time for a safety-valve to act. On inquiry, we find that our correspondent is unable to cite any case within his own knowledge in which a boiler furnished with a safety-valve did burst under those circumstances. While he has no negative evidence to offer, we have the positive evidence of a case in which the boiler had been empty for a considerable part of the twenty-four hours, without the knowledge of the inmates of the house, and when the water came in at the usual supply time the explosion of steam was so violent that part of the brass-work of the safety-valve was crumbled as if by a blow from a heavy hammer; but the boiler was entirely uninjured. The safety-valve was a spring one; we do not recommend these as the best, as there is always a possible element of going wrong in a spring; the dead-weight safely-valve is the most reliable, as that is merely lifting a weight, and there is nothing to get out of order. In deference to our correspondent's criticism, we will go so far as to say that the fact of a safely-valve (even not of the best kind) having saved a boiler once under this extreme stress is not a proof that it will always do so, and that it is much better to avoid all the causes of danger, and have a safety-valve as well, which can do no harm, and is an important additional precaution. We may also add that it is possible to make an important improvement in safety-valves of this description for range-boilers. They are at present made with much the same diameter of steamway as is allowed for relieving a boiler from gradually-increasing pressure, whereas the range-boiler safety-valve is required especially to provide against a very sudden expansion, and its steamway should, as it appears to us, be increased accordingly — a point which we commend to the attention of the makers of range-boiler safety-valves. In the meantime, the undoubted fact that one of the existing pattern of spring safety-valves, with these disadvantages, has saved life in averting a serious explosion, is a reason for thinking that it will do so again, though we admit that it may not be safe to assert positively that it will *always* do so. — *The Builder.*

Builders not bound by Trade-Union Rules. — Builders will be glad to learn that, in the opinion of a London magistrate, they are not bound by the rules of a trade-union. There is nothing new in the decision; but of late years, as the power of workmen has grown, it has been too readily assumed that customs and rules were as much to be respected as clauses, in an Act of Parliament. The case we refer to was heard at the Highgate Police-Court on Monday. A bricklayer who came to work without his tools was dismissed on his return from breakfast. He claimed an additional hour's pay, on the ground that the rules of the Operative Bricklayers of the London district asserted that masters should pay one hour's time over and above what had been occupied at the termination of engagements. It appeared also that the rules received the approval of the Builders' Association. But there was nothing to show that the builder had agreed to accept the rules of the Bricklayers' Society or that he was bound by any act of the Builders' Association. He was not a member of the latter and was not an admirer of the former society. In such a case the magistrate had only one course before him, which was to dismiss the summons with costs. The result, it is to be hoped, will be considered seriously by the workmen of the building trades. If they will not satisfy employers about the quality and quantity of their work they can be dismissed, notwithstanding all the rules which societies can lay down on paper. Strikes may be got up in reprisal for expecting a fair hour's work for fair wages, but as those contests are likely to arise if all profits are made over to the men there is not much use in guarding against them. — *The Architect.*

Wool for a Bridge Foundation. — When the National pike bridge west of Richmond was in process of construction the workmen at the west side of Whitewater River dug down to find a solid foundation. They struck a great and seemingly bottomless bed of quicksand. Vainly they labored to find a safe resting-place for the foundation. Finally the civil engineer and the contractor struck on a novel expedient to overcome the difficulty. They sent men all through the country to buy wool. They purchased nearly all of that commodity in this and adjacent counties, and the primitive woollen mills were compelled to pay high prices in order to procure anything to work on. This wool, unwashed, burrs and all, was delivered here on wagons of all sorts. It came piled high on beds constructed for the purpose, and all was tumbled into the hole intended for the foundation. As pressure was applied it sank some distance into the sand, but finally it would sink no farther. At last, on this woolly foundation, the rocks were laid, and to-day the western abutment of the old National bridge rests on a bed of compressed wool. — *The Indianapolis Sentinel.*

Mme. Dieulafoy and the Academie. — It is rumored here that Mme. Dieulafoy, the courageous woman who accompanied her husband on his dangerous expedition to Persia, will shortly be put up for a fauteuil in the "Académie des Inscriptions et Belles Lettres." Mme. Dieulafoy more than deserves this distinction, for, not content with displaying the greatest pluck under the most trying circumstances, and with helping and seconding her husband throughout his difficult undertaking, she published on her return to France a clever and interesting book relating her experiences during this daring journey, which, from a scientific point of view, can be numbered among the standard works of travel. — *N. Y. Tribune.*

TRADE SURVEYS

The tabulated statements of railroad earnings for the past year show an increase of about nine per cent in earnings over the preceding year. Statements from clearing-house associations show about the same increase in the total volume of business transacted. The figures of imports and exports show a corresponding increase in trade, and, so far as the unreported business of the country is concerned, its volume seems to also have exceeded that of 1891 considerably. Everywhere we see evidences of an expansion of business. At the same time, there is universal complaint as to the character of the business done. Competition has been asserting itself at every point; margins have been narrowed down to limits which render it difficult to make both ends meet; but, despite these facts, an enormous amount of projecting has been done. Enterprising men, capitalists and investors have, for six months past, evidently been making preparations for an expected reaction. If the reaction comes, there will be more and greater opportunities for investment, more margin, and a general increase in industrial and commercial activity. The banking interests are doing their best to make preparations for the increased demands that will be made upon them for funds. Several remedial measures have been proposed in Congress, but none of them are of anything more than a patch-work nature; no comprehensive system has been suggested — perhaps because the time for one has not yet arrived. Whether the banking interests will be able to meet all of the demands which will be made upon them is doubtful, according to many authorities. There is an enormous volume of money now in savings-banks, trust concerns, building and loan associations, and on deposit in various ways, awaiting opportunities for employment, and much of this money will seek the first favorable opportunity for use. At present, it is wiser to let it remain idle than to jeopardize it in investment when there is no absolute need for its activity. This is the opinion held by experts in money matters. Throughout the country the industries are pretty busily engaged, and that there will be an increase in activity is apparent in many quarters. The strongest evidence of this lies in the fact — which deserves special reference — viz, that stocks of all kinds of crude and finished material are now at a rather low point. In fact, some industrial authorities think that the manufacturing interests are making a mistake in checking production so quickly upon the slightest occasion. The danger of the situation now is, in their opinion, that there may be such a sudden stimulus imparted to demand as to create speculative values. Admitting the very worst, it might be said that this result might, in a short time, create an advance of ten per cent in prices where the legitimate advance would not exceed five per cent. But it must be remembered that all through the industries the capacity is much greater than has ever yet been fully employed. Our textile mills are able to produce more than they have ever had a demand for; the same is true in the heavier industries, also in the multitude of shops and factories. At the same time, the far-seeing business men of the country are now beginning to recognize the possibility of danger, due to too great caution in the matter of production. Larger stocks, they think, ought to be carried; and this policy will soon obtain. Advices from agricultural sections point to the possibility of higher prices for cereals and cereal products within the next six months. The farmers are dissatisfied with the returns of the past two years in dollars and cents, although not in bushels and tons. A great deal of new territory will be reduced to cultivation this year. There is a steady outflow of population to the agricultural districts newly opened, and this outflow will continue through the year. According to reports gathered from State authorities, land is increasing in value in nearly all of the Western States, especially along or near lines of railroad. It was recently given out that some 6,000 miles of railroad will be built this year, most of it in regions dependent upon agricultural activity. Reports received from the coal-mining interests indicate that there will be an increase of about ten per cent in production this year. Several very large investments in coal lands have recently been made, notably one by the Vanderbilts in the New River region of West Virginia. A great deal of capital will enter industrial channels this year; such investments will have the preference over most others. Industrial organizations are also multiplying, and a great many will take shape before the opening of spring. It is also stated by New York stock authorities that a large number of new properties will be listed on the Stock Exchange. It is announced by those conversant with the inward and outward flow of American securities to and from Europe that the inward flow will be checked this year, which fact it is of importance to note. If this be true, it means a discontinuance of the drain of gold and an increasing demand for American securities of all kinds. Not until such a demand develops will there be genuine activity on this side. European buyers of our securities have been more or less apprehensive ever since the Baring failure. This timidity in regard to American securities is without cause, and not creditable to the intelligence of European capitalists. But the more intelligent investors now recognize the fact that American securities, in the long run, are the best, even though we should indulge in financial measures not considered wise from the foreign standpoint.

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CONTENTS

SUMMARY: —
The Origin of the Chicago System of Skeleton Building. — The Retempering of Cement. — The latest Discoveries relating to the Pantheon and the Portico of Agrippa. — Trips round about Pekin and what they disclose. — Utilizing the Falls of Tivoli 33
THE ILE-DE-FRANCE SCHOOL OF ARCHITECTURE. — I. 35
OFFICE-HELP FOR ARCHITECTS. — VI. 37
AN ARCHITECTURAL COMPROMISE. 40
SIX HOURS IN SALEM. 41
LETTER FROM SAN FRANCISCO. 44
LETTER FROM WASHINGTON. 44
THE EIGHTH LEAGUE EXHIBITION. 45
DRAINING THE OKEFINOKEE SWAMP. 46
SOCIETIES 46
ILLUSTRATIONS: —
House of S. Alexander Orr, Esq., Troy, N. Y. — Old Colonial Work, Salem, Mass.: Three Pages. — Sketches by the *American Architect* Travelling-Scholar for 1891: Three Pages. — State Asylum for the Chronic Insane, Wernersville, Pa. — House at Setauket, N. Y. — Proposed House at Winchester, Mass. — Sketch for Proposed Presbyterian Church. — Public School Building, Savannah, Ga.
Additional: Central Southern Porch of the Manufactures and Liberal Arts Building, World's Columbian Exhibition, Chicago, Ill. — Private House, Paris, France. — Rear Elevation and Plan of the Same. — Fox Oak, Burhill, near Weybridge, Eng. — Manchester Technical Schools, Eng. — Plans and Section of the Same. 47
COMMUNICATIONS: —
The Validity of General Conditions. — The Destruction of "The Breakers." — Windows over the Fireplace. 47
NOTES AND CLIPPINGS. 47
TRADE SURVEYS. 48

A CORRESPONDENT of the *Engineering News*, speaking of the patents for the metallic skeleton system of building, mentions that, in 1873, an architect named Saulnier proposed and used this system in the construction of a portion of the great Menier chocolate factory, at Noisiel, France. The structure in question was built directly over the River Marne. Four stone piers were set in the stream, and box-girders laid on the piers, and on these girders was constructed a frame of angle-irons and channels, three stories high, which was afterwards covered with a four-inch veneer of colored bricks. A description of the structure, with detailed drawings, was given in the *Encyclopédie d'Architecture* in 1874, and a similar one in the *Deutsche Bauzeitung* in 1878; and the *Engineering News* reproduces the illustrations from the latter, which show a framing very similar to that used in our high buildings, but better braced than is common with us. As the publication of the description of the system, even in another country, would make a subsequent American patent for the same system invalid, the Saulnier designs may become of considerable importance, if Mr. Buffington presses his suits, as it is reported that he intends to do.

AN important investigation was recently carried out by Messrs. L. H. Goddard and P. P. Evans, both graduates in the class of 1892 in the Ohio State University, to determine the amount of injury, if any, which is caused to the strength of cement by retempering after it has begun to set. Architects know that many masons, particularly tile-layers, claim that cement, either Portland or Rosendale, sets as hard if retempered after the initial set has begun as if undisturbed; and tile-layers generally mix their cement purposely overnight, and retemper in the morning of the day in which it is to be used, and insist that it sets harder so than if mixed fresh. Notwithstanding these assertions of the so-called "practical" men, architects and engineers almost universally disbelieve in the virtues of retempering, and it will be a satisfaction to them to know that the results obtained by Messrs. Goddard and Evans fully sustain them in their opinion. The *Engineering News* publishes interesting diagrams and statistics, which show that, for cements of both kinds, the ultimate strength is greatly affected by retempering. Rosendale cements suffer more than Portland, losing, on an average, when used neat, about forty per cent of their strength, at the end of seven weeks, if they are disturbed after the first set has begun; while Portland cements lose, on an average, about twenty-eight per cent. If mixed with sand, both sorts of cement, as might be expected, lose less in proportion than when used neat, and Rosendale cements that have been injured by retempering regain some of their properties with age, while Portland cements lose with time. The retempering makes the cement easier to work, and this is probably the real reason why the tile-layers practise it, but instead of being advantageous to the firmness of the tiling, it seems to be particularly detrimental, for, at the end of seven days, which is just about the time that elapses before a tile floor is thrown open to use after laying, it is found that Rosendale cement which has been retempered has only seventeen per cent of the strength of that mixed and laid fresh, while Portland cement has only fifty-five per cent. The publication of this important paper, which formed the graduating thesis of its authors, is due to an admirable arrangement by which the *Engineering News* gives prizes in money every year to the authors of the best graduating theses in engineering schools. This thesis, which received last year the first prize, of seventy-five dollars, would probably have been lost to the professions which it concerns had it not been for this excellent plan, by which intelligent students are encouraged in serious and scientific work, at the same time that the results of their labors are given the publicity that they merit.

A VERY curious discovery has been made in the Pantheon at Rome. As every one knows, the Pantheon has been the subject of an immense amount of archæological and historical speculation, and almost numberless stories have been invented to account for its construction and design. An inscription on the entrance-portico asserts that Marcus Agrippa caused the building to be constructed in the year of his third consulship, which is known to have been the year B. C. 27, and behind the great rotunda are the ruins of baths, also known to have been built by Agrippa, connected with the Pantheon by the remains of spacious passageways. These circumstances, added to certain facts of history, have suggested the romantic story that the Pantheon originally formed part of the plan of the baths, but that, on its completion, it was so vast and splendid that some of Agrippa's enemies raised an outcry, saying that the impious son-in-law of Augustus, forgetting his duty to the immortal powers, had erected a mere bath-house superior in magnificence to the dwelling of any of the gods. The story goes on that Agrippa, alarmed at the prospect of a public accusation of impiety, which might have had serious consequences for him, hastened to proclaim that he had really intended the building, not for a bath-room, but as a temple to all the gods at once; and having, by this astute move, engaged the favor of the entire celestial family, he caused the seven niches to be cut in the walls, which still remain, and placed in them statues of the seven principal Roman deities, Julius Cæsar, as is known, having been one of them. This interesting tale has the disadvantage of being extremely improbable, but nothing much more reasonable seems to have been conjectured to take its place, and the history of the design and erection of one of the noblest buildings in existence, containing the widest dome ever constructed by human hands, is practically unknown.

UNTIL very recently, there has been no question that the rotunda was, at least, as old as the portico. It has, indeed, often been suggested that the rotunda might have been previously built, and that Agrippa only added the portico to it; but there is no mention in history of the existence of any such structure before Agrippa's time, so that it has been generally concluded that the rotunda and the portico were designed and built together. Now, however, a grave doubt is cast upon this point. It appears that M. Chédanne, a young Grand-Prize student of architecture in Rome, learning that some repairs were to be made on the roof of the Pantheon, where a leak had shown itself, obtained leave from the Italian authorities to supervise the work, and, in the course of his inspection, made some singular discoveries. Like most of the Roman vaults and domes, the roof of the Pantheon is made with a sort of network of ribs of brick, the interstices between the ribs being filled with concrete. In the course of the

repairs some of the ribs were disturbed, and a large number of bricks taken out from various parts of the structure. Many, perhaps all, these bricks were found to be stamped with various inscriptions and devices, generally giving the name of the maker and the place at which they were made. Now, so far as is known, no stamped bricks were used in Rome before the second century A. D., or nearly a hundred and fifty years after Agrippa's time; and, although it is, of course, not impossible that an early brickmaker might have stamped bricks for a single building, it appears that every one of the inscriptions and devices found on the Pantheon bricks has been found on bricks in other buildings, which are known to have been erected during or near the reign of Hadrian, A. D. 117–138. It thus appears certain that the ribs of the dome, at least, must have been constructed long after Agrippa's time, and, as the ribs are the essential part of the dome, it is difficult to avoid the conclusion that the dome, which is the most important part of the building, with, very possibly, the rotunda itself, was erected, not by Agrippa, in the time of Augustus, but by some unknown person about a hundred and fifty years later.

OBVIOUSLY, the next question is, how to account for the portico attached to the front of the building, and bonded in with it, and bearing the name of Agrippa. It seems that, on excavating in the floor of the rotunda, a pavement was found seven feet below the level of the present pavement, and M. Chédanne thinks that this, together with the present portico, was a portion of Agrippa's Pantheon, and that, when the rotunda was reconstructed, in Hadrian's time, the ground had risen outside the building, as it has generally in Rome, and the floor of the new structure was set much higher than the old pavement, while the old portico, which had been carefully taken down, was rebuilt, in connection with the new rotunda, at the higher level. We must confess that this hypothesis appears to us to have some weak points. Even supposing that the Romans of Hadrian's time had been seized with a disposition — which they never seem to have shown in any other instance — to restore Agrippa's portico exactly as it was before, in connection with a magnificent new building, with which he had nothing to do, and which would have reflected the highest honor on its real author, it is inconceivable that, in a hundred and fifty years, the ground outside should have risen, by the accumulation of rubbish, so much as to require the new pavement to be seven feet above the old one. We know that the floor of the present Pantheon was originally five steps above the street. Three of these steps are now covered, and the pavement of the little Piazza on which the building faces descends slightly toward the portico; but, even supposing the difference of level between the street as it now is and as it was when the floor of the rotunda was laid to be five or six feet, it is still unexplained why the street should have risen as much in a hundred and fifty years — between Agrippa and Hadrian, — as in seventeen hundred years subsequently. It may be, of course, that the street grade was purposely raised in or about the first century, and this might explain the rebuilding of the portico, and even the filling up of the interior to the new level, but it would hardly require the destruction of the original building. Excavations, however, would determine many of these points. It would be easy to see whether the soil below the present steps was accumulated débris or filling purposely placed there, and as the foundations, either of the original building or any subsequent one, must have been carried down to the virgin soil, it would probably not be difficult to ascertain something about, at least, the plan of whatever earlier building, if any, stood upon the site.

AT a recent meeting of the Munich Society of Architects and Engineers, Professor Buchner, the conservator of the Munich Ethnographical Museum, read a very interesting paper on China, which is, to architects, an almost unknown region. He began by comparing it with Japan, which is a pleasant country to travel through, and at first extremely interesting, but which, he thought, has reached its highest civilization, and is likely to lose in interest, while China, though disagreeable in climate, and inhabited by a surly and repulsive population, produces a certain imposing effect on the mind of the tourist. Concerning the journey to Pekin, Professor Buchner said that it was full of strange and surprising impressions. The journey must be made by water, through a country almost desert, to Tientsin, whence the land journey to Pekin, about a hundred miles, is made on horseback. The road leads through a region completely waste and deserted, and it is with something like fear, as at a supernatural apparition, that the traveller first sees the monstrous walls of the city, seventeen miles long, and from seventy to a hundred feet high, and mixes with the throng of people at the entrance-gate. There are nine of these gates, all of which are shut at sunset, and not opened until sunrise the next morning. Each gate is guarded by two huge towers, like pylons. The towers are pierced with innumerable windows, which are closed by wooden shutters, and on each of the shutters is painted the muzzle of a cannon. Inside the gates the most conspicuous objects are masses of ruins. The city, which would accommodate ten million inhabitants within its walls, if packed as closely as is usual in Chinese towns, and which ranked not very many years ago as the most populous city in the world, has now only half a million inhabitants, its former glory being shown only by acres of abandoned dwellings. Whether it ever held ten million people, even though there would have been room for them, is doubtful, but it was certainly once a vast and very cosmopolitan city, for three Roman Catholic cathedrals and several Arabian mosques still remain to recall the days when there were foreigners enough to fill them all. Now, there is practically no foreign population. About a hundred foreign tourists, on an average, visit the city every year, but there is no accommodation fit for them, and Europeans, whose stomachs will not endure the Chinese habits of living, bring all their provisions and household apparatus, and even their drinking-water, from Tientsin.

THERE are three interesting trips to be made from Pekin: one to the Chinese wall, one to the tombs of the Ming emperors, and the third to the ruins of the Summer Palace. That to the Chinese wall is the most novel, as it leads all the way along the great road, in which the tourist meets a stream of caravans, bringing furs, frozen sheep, and other luxuries to Pekin, while from time to time the Russian post-horses may be seen carrying the mails over what is now an official Russian route. The ruins of the Summer Palace have more architectural interest than almost anything else in China. This palace, the pride of the kingdom, was built for the emperors in the palmy days of Pekin, under the direction of European Jesuits. The Jesuits have always been well instructed in architectural design of the gorgeous Renaissance type characteristic of their buildings, and they produced for their Imperial employers a magnificent mass of beautiful baroque detail, curiously mixed with Chinese motives. As is well known, this palace was burned, by order of Lord Elgin, as a punishment for the treachery of the Chinese Government in the massacres of 1859 and 1860, and the treasures it contained were scattered all over the world; and it has never been rebuilt.

ONE can hardly imagine what Julius Cæsar, or, let us say, Cato the Censor, would have said, if he had read in the Sibylline books that a company of Scythians would, two thousand years after his death, install an apparatus through which the streets of Rome would be illuminated every night by a cascade at Tibur, twenty miles off in the Alban Hills; yet that is just what has come to pass. Several years ago an Italian company undertook the utilization of the Tibur, or Tivoli, water-power, by means of turbine-wheels and dynamos, for the purpose of lighting the little town of Tivoli. Soon afterward, the establishment passing under the control of the Roman Gas Company, the plant was increased, until it now collects and transmits a force of twenty-seven hundred horse-power, and wires have extended to Rome. The experiment proved so successful that it has now been determined to utilize the whole available force of the cascade, amounting to about five thousand horse-power, and the contract has been intrusted to a firm in Buda-Pesth, Hungary. The current will be transmitted, at a pressure of fifty-one hundred volts, through copper cables, protected with special care, as they must cross the desolate Campagna, and would otherwise be at the mercy of brigands. The cables enter Rome at the Porta Pia, where the current is converted by thirty-two transformers into one of two thousand volts, this being the pressure for which the city system of electric lighting is designed. In the city itself preparations are being made for increasing greatly the lighting plant. In place of two hundred and fifty arc-lamps, the present number, six hundred will be installed, and the system, when complete, will be the most important example of transmission of electric force in the world.

THE ILE-DE-FRANCE SCHOOL OF ARCHITECTURE.[1] — I.

Fig. 1. Vaulting from the Palace of the Thermæ, Paris.

THE regional school of Ile-de-France, termed also the school of the royal domain, the French school, and sometimes the Parisian, has its geographical centre at Paris; but before the sixteenth century this city did not play the part in the development of architecture around it that its political importance and the intensity of its intellectual life would naturally seem to have forced upon it. That rôle was filled at short intervals, and, as it were, incidentally by Saint-Denis; the Ile-de-France of the Middle Ages had, in fact, no artistic centre. There was perhaps less uncertainty and less fluctuation in the boundaries. At the close of the twelfth century, the period when the French school was at the zenith of its influence and glory, we find its limits on the south, following the course of the Loire from Gien to Blois; passing on the west near Vendôme, Châteaudun, Chartres, and Dreux, in a way to include these towns and then join the Epte, the Norman frontier; on the north, running a little below Amiens, Péronne, and Saint-Quentin; and wresting from the School of Champagne, on the east, Laon and Soissons, but sharing with it Meaux, Provins, and Sens.

Within these bounds lie the entire province of Ile-de-France, as Richelieu left it, a narrow strip of land belonging to Picardy, a small section of Champagne, and more than half of Orléanais. In view of the fact that, notwithstanding their administrative union with Ile-de-France, Beauvaisais, Valois, Soissonais, and Laonnais were Picard districts, there is ample justification for the term "Picard School," which was for some time during the Middle Ages applied to a variety of architecture that grew up within the French school itself and which was at one time as influential as the latter.

Nothing prior to the latter part of the eleventh century betokened the artistic eminence which the Parisian school was destined to attain under Roman supremacy; the cities of the north, with perhaps the exception of Rheims and Autun, possessed no monuments at all comparable with those of the southern cities, and especially with those of Narbonnaise. The protracted sojourn at Paris of the emperors Constantius, Chlorus, Julian, Valentinian I, and Gratian — during the period of Roman decadence — at no time raised the future capital of France to the rank of political or intellectual capital of the

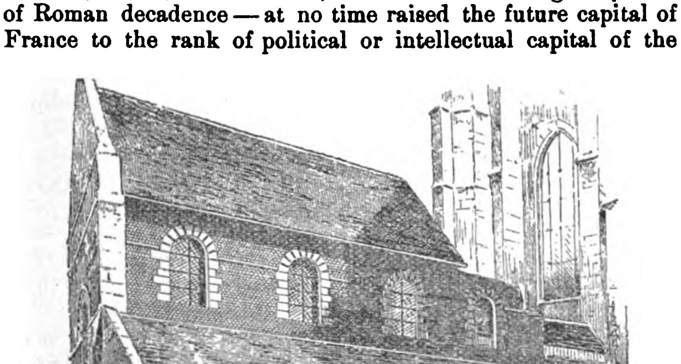


Fig. 2. The Basse-Œuvre, Beauvais.

Gauls. We find hardly any edifice worthy of being cited here except the Palace of the Thermæ, the ruins of which still exhibit a superb intersecting vault (Fig. 1). This may have furnished some elements to the early Romanesque constructors. The Merovingian kings, who resided at Paris, Soissons, and Orléans, were not powerful enough themselves, nor were they ably enough seconded to avert the downfall of monumental art. Among the churches left by them, only two, Saint-Germain-des-Prés, erected at Paris, by Childebert I, and the basilica of Saint-Denis, the architectural triumph of the reign of Dagobert, attracted the attention of contemporaries; and we learn from the writings of Suger that the latter was not so much distinguished for grandeur of dimensions as for the sumptuousness of the paintings and of the productions of the goldsmith's art. There is, however, evidence elsewhere that masonry and sculpture had not dropped into utter oblivion. It is indeed possible that the crypt of Saint-Avit, at Orléans, discovered beneath the great seminary, belongs to the sixth century; it is lacking neither in harmony of proportions nor in solidity [see *Crypte*, Fig. 5]. The famous crypt of Jouarre, in Brie [see *Crypte*, Figs. 6, 7, 8, and *Eglise*, Fig. 34], is less noted for its masonry, which is rather coarse, than for its oft-cited capitals. Capitals quite as interesting as these have been dug up at different times at Paris; others have been preserved in edifices reconstructed in the twelfth century, as for example, at Saint-Germain-des-Prés and Saint-Pierre-de-Montmartre.

Pépin le Bref restored and enlarged the basilica of Saint-Denis; but it is difficult to believe that this structure remained intact down to Abbé Suger's time, and that the Romanesque confessional, still in existence at the centre of the crypt, dates back of the early part of the eleventh century, when doubtless a second restoration was made, although the fact is carefully ignored by the illustrious monk, of whom we shall have more to say later.

It was Pépin's son Charlemagne who, in fact, ushered in the so-called Carlovingian or Carolingian era of art. But with

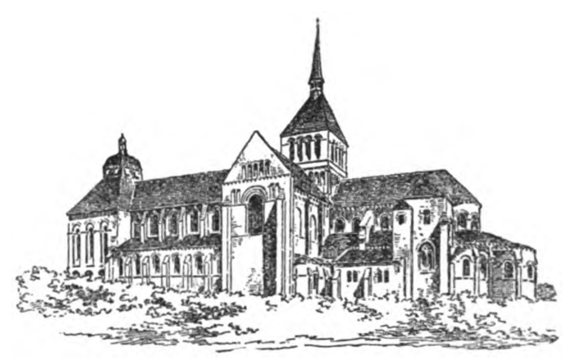


Fig. 3. Church of Saint-Benoît-sur-Loire.

Charlemagne the intellectual centre also was displaced, to the advantage of Germany. The church of Germigny-des-Prés, erected in 806 by Bishop Théodulfe of Orléans, is an isolated product on the banks of the Loire of the great movement in progress beyond the Rhine (see *American Architect* for July 12, 1890, "Religious Architecture," Fig. 3; also for May 14, 1892, "Byzantine Architecture," Fig. 14). Its plan, in the form of a Greek cross with four terminal apses, its domes, its lantern-tower, and even its structural arrangement in broad courses did not found a school in the middle basins of the Loire and the Seine. On the advent of the Capetian dynasty to power, in the dioceses of Orléans, Beauvais, Soissons, and Laon, where there are noteworthy remains of the period, we find the Roman constructional system, with or without in-bond brick-pillars (Saint-Pierre-le-Puellier, at Orléans, Basse-Œuvre of Beauvais (Fig. 2), Hermes, between Beauvais and Creil, etc.), and the triple aisles with square pillars and no vaults. We are, however, approaching a preparatory period, which begins in 997, with the reign of King Robert, sometimes styled "the father of religious architecture." The impelling energy came rather from the bishop and the monks. We can ascribe nothing to King Robert personally, except the founding of Notre-Dame at Étampes, the primitive crypt of which belongs to the eleventh century, and a reconstruction of Saint-Aignan at Orléans, which likewise still retains its eleventh-century crypt. The plan of the latter confirms the remark of the chronicler Helgaud, who says that the choir of the basilica was built in imitation of the Cathedral of Clermont, in Auvergne. We have here, doubtless, the earliest deambulatory and the first radiating chapels constructed within the royal domains. About the same time a Romanesque

[1] From the French of Anthyme Saint-Paul, in Planat's *Encyclopédie de l'Architecture et de la Construction*.

cathedral was erected at Orléans, at great expense, and Gauzlin, abbot of Saint-Benoît-sur-Loire, began, by the construction of a magnificent porch, with storied capitals, and a huge tower, half belfry, half donjon, works which made the church of his monastery almost a rival of that of Cluny [see *Eglise*, Figs. 18, 19, 21]. These works were abandoned for a while at one time, but they were resumed in 1069 and completed in 1131. On the death of King Robert, in 1031, the great Cathedral of Chartres, begun by Fulbert, had been in process of construction ten years already, so that a solemn consecration took place in 1037. The present nave of Saint-Germain-des-Prés, at Paris, is attributed to another contemporary of Robert, Abbé Morard. It was, we believe, built after 1050, at about the time that Countess Hodierne de Montlhéry erected for her priory of Longpont the church whose apse and transept have just been so successfully restored by the architect Naples.

Fig. 4. Portal of Saint-Basile, Etampes.

Beauvais did not wait for the terrors of the year 1000 to pass. Bishop Hervée, in 997, took the lead in the construction of four churches here: the Haute-Œuvre, Saint-Etienne, Saint-Gilles, and Saint-Laurent.

These edifices and many others that we cannot now cite started a movement which gained steadily in force until the close of the twelfth century, and out of which the French school sprang. The latter settled into form as a Romanesque school from about 1060. The claims of the Parisian school to a real existence during the Romanesque period have been but recently called in question by us, and we were certainly right in one sense, for prior to the Pointed period there was neither vaulting device nor decorative system peculiar to the French region. But arguments against our position were thereupon brought forward, the force of which we must recognize, and which are, moreover, based on our own writings. In fact, the French school of the second half of the eleventh century possesses, if not its finished architectural form, at least its characteristic physiognomy. Quite unlike the other schools, which seem to move consciously in a certain direction, it gropes its way in a waiting spirit, which is only in appearance in action. The student detects the proofs of eclecticism, of restless search, on the part of the architect. This very slowness of assimilation and this dullness of invention were destined to become the best guaranty of a success that lost nothing by being delayed somewhat. One must be bigoted indeed to pass hastily or disdainfully over the purely Romanesque structures of the French school; certain ones offer typical dispositions, some of which were perpetuated in the Gothic monuments and did not fail to exercise an appreciable influence on them.

The French Romanesque churches are usually not vaulted. Saint-Germain was without vaults, in the side-aisles as well as the naves, before the seventeenth century (and those were not the vaults of to-day, which are imitations of the ones in the choir); other less important naves were vaulted between the twelfth and sixteenth centuries; several were so constructed as to make vaulting impossible, for example, in cases where the upper windows bestride the pillars. This last disposition, which Viollet-le-Duc noted in Burgundy, in the abbey-church of Fontenay, we have found north of Paris in at least nine localities, namely, at Fosses and Fontenay-lès-Louvres, naer Luzarches, at Cormeilles-en-Vexin, at Plailly, near Senlis, in Saint-Denis at Crépy-en-Valois, in Saint-Gervais at Pontpoint, between Pont-Sainte-Maxence and Verberie, at Orrouy and in the ruined church of Champlieu, at Terney, between Soissons and Coucy. Doubtless the number of examples might be still further augmented; but it should be remembered that this method of setting the windows was in vogue, as is indicated here and there by the style of the pillars, until the middle of the twelfth century, a period when ribbing was universally understood, and when, consequently, it was not always an indication of want of power.

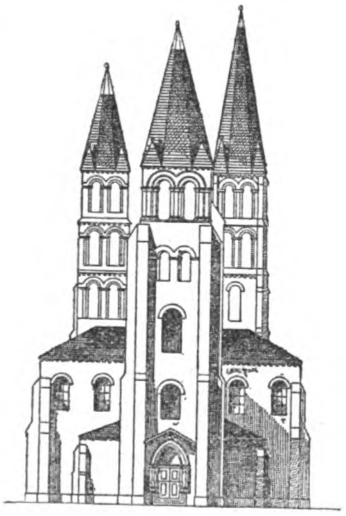


Fig. 5. Saint-Germain-des-Prés, Paris (Restoration).

The few apses that still remain are covered by a half-dome; the Roman intersecting vault is quite common; the cupola is almost unknown.

There are comparatively few examples of Romanesque portals in the Parisian school, but there are enough to show that this district is hardly behind its neighbors in the matter of luxurious decoration. This is seen at Saint-Basile of Étampes (Fig. 4), at Ouzouer-sous-Bellegarde, at Trie-Château, in Saint-Etienne at Beauvais, at Villers-Saint-Paul, etc.; each one of these types has its own bit of originality.

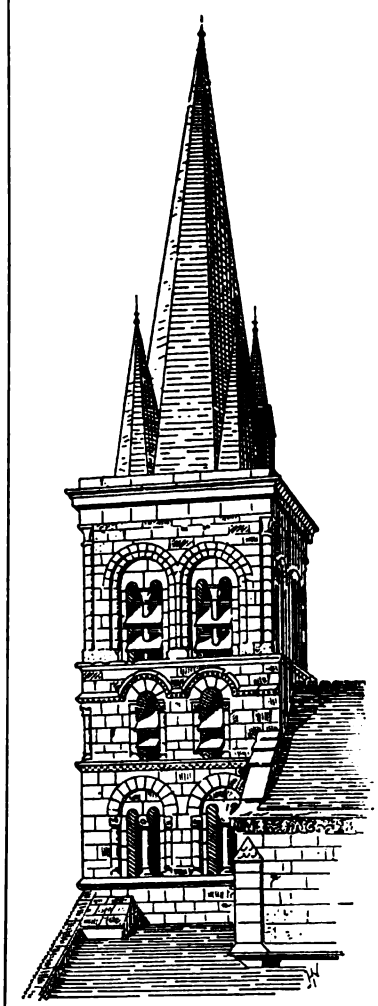


Fig. 6. Belfry of Urcel (Aisne), after a Photograph by M. E. Durand.

One of the elements which the Parisian school relies upon most in the expression of its individuality is the belfry. If I interpret aright the term "*arx*" used by the poet Fortunat in the sixth century in connection with Saint-Germain-des-Prés, — then Saint-Vincent, — this Merovingian church possessed a central tower forming a lantern, similar to those known to have existed, at the same period or from the preceding century, at Nantes, Tours, and Narbonne. There is a lantern-tower dating from the reign of Charlemagne at Germigny-des-Prés. But this fashion was not perpetuated when the progress of Romanesque art became more pronounced. The church of Saint-Benoît-sur-Loire (Fig. 3), a structure of exceptional richness and development (there is no call for us to discuss here its plan, in the form of an archiepiscopal cross), has a central belfry borne on vaulting, besides three others, one at the entrance to the nave and two at the beginning of the apse. Let us imagine the central tower removed, — an element rejected by the French school in the eleventh century and afterward accepted by it with some reservation, — and let the relative position of the other three be retained; we shall find the arrangement reproduced at Saint-Germain-des-Prés (Fig. 5) and at Morienval [see *Eglise*, Figs. 36, 37, 38]. If this disposition is to be ascribed to the influence of Saint-Benoît-sur-Loire, it is probably the only one traceable to that source. For the sake of concentrating our attention on as small an area as possible, let us eliminate for the time being the basin of the Loire; that section of it indicated above was, in fact, not closely connected with the French school before the formation of the Gothic style.

As has just been said, the French school of the eleventh century barred out the central belfry. When the towers ceased to be built as lanterns, and quite heavy bells were suspended in them, architects were afraid to rest them on the four arches at the intersection of the nave and transept. They therefore disposed them at the entrance to the nave, on the west, when they were to serve as works of defence; in ordinary cases, they rose at the right or left of the choir; we are considering now the single tower; we have already indicated the disposition

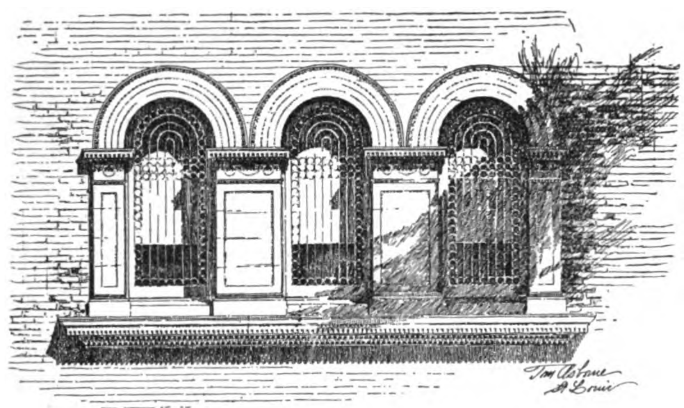
when there were three; if there were two, they would naturally stand on the sides of the choir, as at Notre-Dame of Melun, or at the angles of the façade, as in the church of Saint-Denis, that was torn down by Suger.

Octagonal towers, which presupposed a considerable advancement in the art of building, were not attempted before the latter part of the twelfth century, and in all instances they may be looked upon as exceptions. The square tower, with upper stories lighted by twin bays pierced in each face, always had the preference. In Picardy these bays are often subdivided, as appears in the western towers of Urcel (Fig. 6) and of Morienval (see *Eglise*, Fig. 37); this distinction is observable in the structures of Picardy and Ile-de-France until the close of the Middle Ages.

(To be continued.)

OFFICE-HELP FOR ARCHITECTS.[2] — VI.

CHAPTER II. — RESISTANCE OF MATERIALS.



SECTION I. — DEFINITIONS:

§ 158. General: — A material is strained when it is subjected to the action of an external force, which causes stress in the fibres of the piece to resist it. In buildings and elsewhere pieces are subjected to strain due to the external forces of the wind, people, furniture, floor-construction, etc., the forces being named according to the way in which they act, as follows:

Compression: — When the forces tend to reduce the size of the piece by pressing the fibres past one another in the direction of their length.

Shearing: — When they tend to cause one set of fibres to slide past another set, usually in a direction at right angles to their axes.

Tension: — When applied in the direction of the fibres and tending to pull them apart.

Torsion: — When applied perpendicularly to the fibres and tending to twist them apart.

Transverse: — When perpendicular to the fibre in such a manner as to cause compression in the fibres on one side of the neutral axis and tension on the other.

§ 159. Live Loads: — External forces are called "live loads" when they are variable, as the load due to people, furniture and the like. All live loads should be applied as far as possible without shock, as the effect of the impact is to double the strains due to any load. The distribution of the load is also important, as a concentrated load at the centre has double the effect that a uniformly distributed load of the same size has. These loads must be assumed in all cases.

§ 160. Dead Loads: — Are the loads in a structure due to the weight of the material used and can be calculated, the calculation requiring a series of approximations. They are therefore usually assumed at a certain figure known by experience to be very near the truth.

§ 161. Effect: — When a piece is strained by the imposition of a dead or live load it tends to cause the particles of the piece to move, and this tendency is resisted by the stress in the piece. So long as the stress in the piece is such that it will return to its original size and shape when relieved the piece is said to be strained within its "elastic limit." When the strain exceeds the elastic limit the piece takes a permanent set or is crippled, and then repeated applications of the load will in time cause failure, even if the load is well within that which would cause rupture if applied to the piece only once.

[2] By George Hill, Consulting Engineer. Continued from No. 888, page 209.

§ 162. Failure: *Compression:* — Failure here comes either by a crushing-in of the fibres or by a wrinkling or buckling of the extreme fibres, crushing-in some and tearing apart others.

Shearing: — Fibres are pushed apart in sets or groups.

Tension: — Fibres are pulled apart.

Torsion: — Fibres are twisted apart, as in a shaft with a pulley.

Transverse Strain: — Usually causes failure either by the tearing apart of one set of fibres or the crushing, wrinkling or buckling of the other set. Under loads so applied, the beam or girder deflects until finally the rupture occurs.

§ 163. Elastic Limit: — Should be, closely, one-half of the ultimate strength of any material. Long-continued application of a load only slightly in excess of this limit will finally result in rupture.

§ 164. Safe Strains: — Should be limited to one-half of the elastic limit where the maximum can be accurately determined and is of infrequent occurrence, but for all general cases it should be made one-third of the elastic limit. The safe fibre-strains given in Table IV are those generally approved, although there is very little data from tests of full-sized pieces on which to base them, and they are certainly too low for thoroughly first-class timber, free from all imperfections and well seasoned.

Certain classes of material should rarely be subjected to certain strains: for instance, cast-iron should sparingly be used in tension; cement, lime or mortar should never be used in tension and should be guarded against vibration; wood should be used sparingly in tension and never in torsion; masonry should never be used in tension.

§ 165. Factors-of-safety: — Should more properly be called, "factors-of-ignorance," since they are necessary to cover the unknown elements of the problem: the strength of the particular piece of material that we are using, the unknown loads that may in time be used, and similar circumstances. Should the elastic limit only of the material be known, divide it by 3 for the safe fibre-strain; if only the ultimate strength be known, divide by 10 for woods and masonry; by 4 to 5 for wrought-iron or steel; by 8 to 10 for cast-iron.

§ 166. Centre of Gravity: — Is that point of a mass on which it will balance itself if there supported and only acted on by gravity.

§ 167. Neutral Axis: — Is a line drawn in any direction through the centre of gravity. In bodies subjected to transverse strain, all the fibres on one side of the neutral axis are assumed to be subjected to compression and on the other side to tension.

§ 168. Moment of Inertia (I): — Is the sum of the products of each particle of a mass in any section at right angles to its axis, multiplied by the square of the distance of each particle from the axis around which this section is assumed to rotate.

§ 169. Radius of Gyration (r): — Is the distance from the axis around which the section rotates to the point which represents the average distance of all the particles in the section away from the neutral axis.

§ 170. Moment of Resistance (R): — The moment of resistance of any fibre equals the moment of inertia divided by the distance of the fibre from the neutral axis. This distance is called n.

§ 171. Bending Moment (M): — The effect of a force applied to any piece loaded transversely, considered in relation to some fixed point, is called its "moment," and equals the amount of the force multiplied by the distance from the point of application of the force to the point around which moments are being taken, measured in a direction perpendicular to the line of direction of the force. At any point in a beam the moments on opposite sides of this point are equal. The point of greatest bending-moment in a beam, referred to either point of support, is that point where the amount of the load equals the reaction at the point of support, and is obtained by passing from the point of support along the beam until the loads passed over equal the reaction at the starting-point.

SECTION II. — FORMULÆ:

§ 172. Compression: — For wood, stone and brick.

For short columns ($l = d \times \frac{5}{8}$).

$$W = Sc \times A \tag{1}$$

$$A = \frac{W}{Sc} \tag{2}$$

For long columns in which $l > \frac{5\,d}{6}$ use.[1]

$$W = \frac{A\,Sc}{1 + \frac{(12\,l)^2\,n}{r^2}} \qquad (3)$$

$$A = \frac{W + \frac{Wn\,(12\,l)^2}{r^2}}{Sc} \qquad (4)$$

For cast-iron, wrought-iron and steel.

For short columns $l =$ or $< \frac{5\,d}{3}$

$$W = Sc \times A \qquad (5)$$

$$A = \frac{W}{Sc} \qquad (6)$$

For long columns $l > \frac{5\,d}{3}$

$$W = \frac{A\,Sc}{1 + \frac{(12\,l)^2\,n}{r^2}} \qquad (7)$$

$$A = \frac{W + \frac{W\,(12\,l)^2\,n}{r^2}}{Sc} \qquad (8)$$

In which n is a factor as given in Table V below.

TABLE V.[2]

VALUE OF n.

Material.	Both ends square.	One end square. One end pointed.	Both ends pointed.
Cast-iron	0.0003	0.0004	0.00057
Wrought-iron	0.000025	0.000033	0.00005
Steel	0.00002	0.000025	0.000033
Wood	0.00033	0.00044	0.00067
Stone	0.002		
Brick	0.0033		

§ 173. **Tension**:— For all pieces

$$W = St \times A \qquad (9)$$

$$A = \frac{W}{St} \qquad (10)$$

§ 174. **Shearing**:— For pieces subject to direct shear

$$W = Ss \times A \qquad (11)$$

$$A = \frac{W}{Ss} \qquad (12)$$

For shear in girders see § 202.

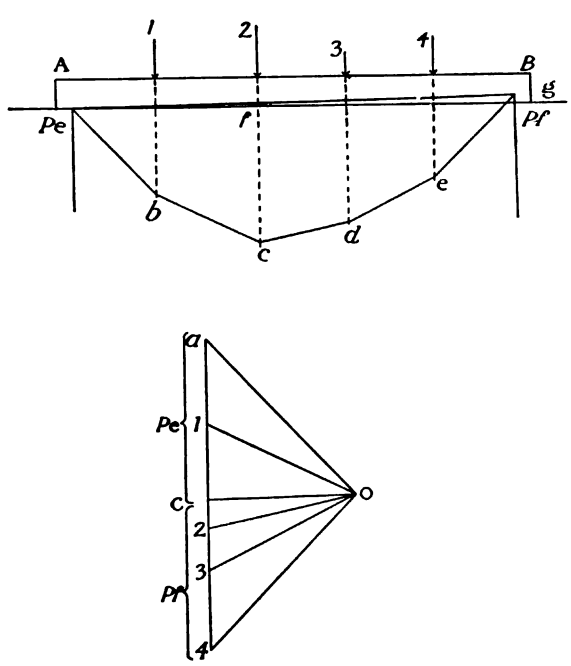


Fig. 20.

§ 175. **Transverse Stress**:— The relations of r, I, M, R are as follows:

$$R = \frac{I}{n} = \frac{M}{S} = \frac{3\,l\,W}{2\,S} \qquad (13)$$

$$r = \left(\frac{I}{A}\right)^{\frac{1}{2}} \qquad (14)$$

$$M = R\,S = \frac{S\,I}{n} \qquad (15)$$

$$I = Rn = \frac{Mn}{S} = Ar^2 \qquad (16)$$

$$S = \frac{3\,W\,l\,n}{2\,I} = \frac{3\,W\,l}{2\,R} \qquad (17)$$

Values of r, I, and R are given in Table VI. For various

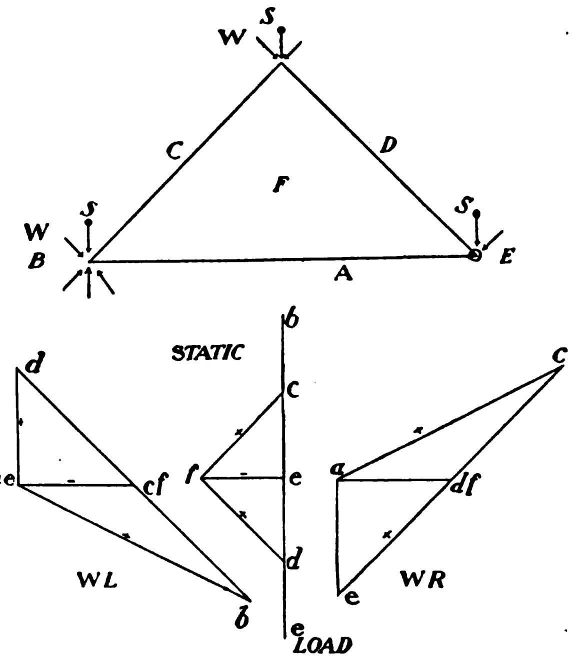
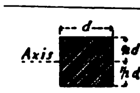
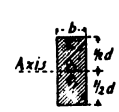
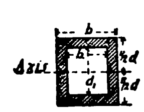
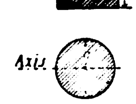
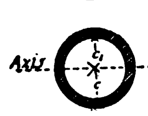
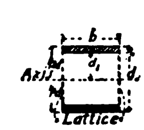
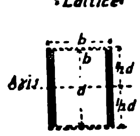
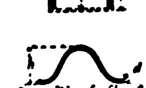


Fig. 21.

sections and for the usual steel and iron shapes are given in the Tables of Properties — Table VII.

The maximum effect of a load in tending to disrupt a beam is called its maximum bending-moment and is resisted by the fibres of the beam as shown in the above equations.

TABLE VI.

Section.	I	R	r^2
	$\frac{d^4}{12}$	$\frac{d^3}{6}$	$\frac{d^2}{12}$
	$\frac{b\,d^3}{12}$	$\frac{b\,d^2}{6}$	$\frac{d^2}{12}$
	$\frac{b\,d^3 - b_1\,d^3}{12}$	$\frac{b\,d^3 - b_1\,d_1^3}{6\,d}$	$\frac{b\,d^3 - b_1\,d_1^3}{12\,(b\,d - b_1\,d_1)}$
	$\frac{11}{14}\,c^4$	$\frac{11}{14}\,c^3$	$\frac{c^2}{4}$
	$\frac{11}{14}\,(c^4 - c_1^4)$	$\frac{11}{14}\left(\frac{c^4 - c_1^4}{c}\right)$	$\frac{c^2 + c_1^2}{4}$
	$\frac{b}{12}\,(d^3 - d_1^3)$	$\frac{b}{6\,d}\,(d^3 - d_1^3)$	$\frac{d^3 - d_1^3}{12\,(d - d_1)}$
	$\frac{d^3}{12}\,(b - b_1)$	$\frac{d^2}{6}\,(b - b_1)$	$\frac{d^2}{12}$
		$\frac{4}{15}\,b\,d\,h$	

To determine the position and amount of the maximum bending-moment, the bending-moment at any point in a beam

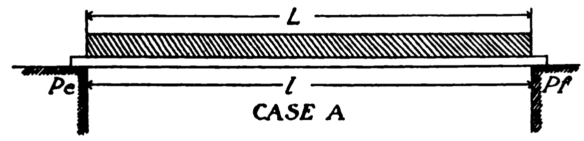
[1] Rankine's Formula.
[2] From Berg, p. 23.

and the reaction at the points of support for any condition of loading, draw the beam to some convenient scale, marking on it the points of application of each load. (Fig. 20.) Then draw a vertical line and lay off on it, to any convenient scale (say 200 pounds = 1″), the loads, thus $a\,1$ = load 1; 1, 2 = load 2; 2, 3 = load 3; and so on. Take any point 0 and draw lines connecting it with a, 1, 2, 3, 4. Then from P_e, draw a line P_b, parallel with $a\,o$ until it meets a vertical that point to the line $a\,f$ measured in inches and will be a maximum, when this distance is a maximum.

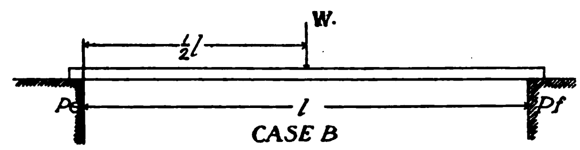
This method may be followed with equal facility when there is but a single load, giving results much quicker than by calculation, and with sufficient accuracy if the scale chosen is such as to enable you to scale a load within 5%.

By calculation, the maximum bending-moment may be found from the following formulæ (Fig. 21):

CASE *a*. $M = \frac{L\,l}{8} \times 12$ (18)



CASE *b*. $M = \frac{W\,l}{4} \times 12;\; L = 2\,W$ (19)

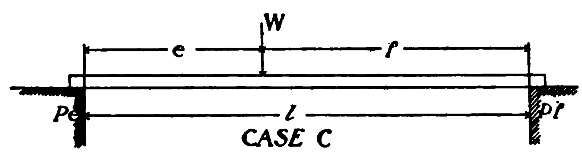


CASE *c*. $M = \frac{W\,e\,f}{l} \times 12$ (20)

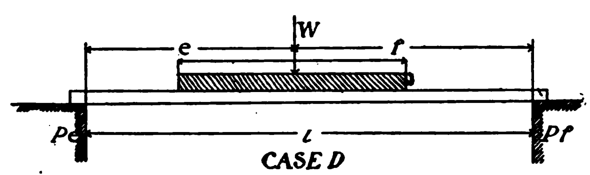
$= P_e\,e \times 12$ (21)

$= P_f\,f \times 12$ (22)

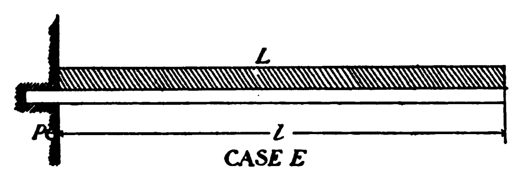
$L = \frac{8\,W\,ab}{l^2}$



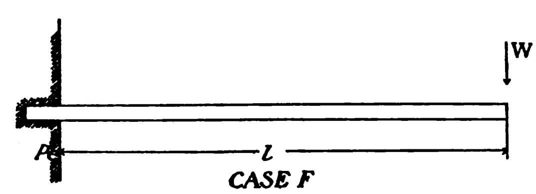
CASE *d*. M = Same in Case *c*.



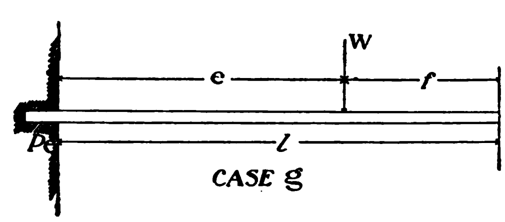
CASE *e*. $M = \frac{L\,l}{2} \times 12;\; L = 4\,W$ (23)



CASE *f*. $M = W\,l \times 12;\; L = 8\,W$ (24)

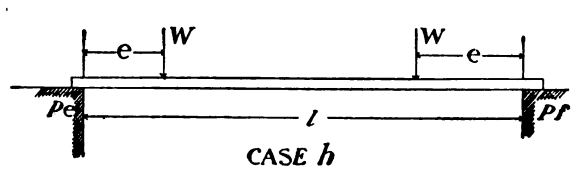


CASE *g*. $M = W\,e \times 12$ (25)



CASE *h*. $M = W\,e;\; L = \frac{8\,W\,e}{l}$ (26)

if $e = \frac{1}{3}\,l;\; L = W$



dropped from 1, then from this point draw a line parallel to 1, 0 until it meets a vertical dropped from 2 and so proceed until the line drawn parallel with 4–0 passes through a vertical from P_f; connect this point of intersection with P_e and draw a line from 0 to a–4 parallel with this line. It will divide a–4 into two parts which will equal the reaction at P_e and P_f. Draw a line through o horizontally calling its value, as scaled, H. Then the bending-moment at any point on the beam = the product of H by the distance from the line a, b, c, d, e, f, at

In Cases a, b, c, d, the point of greatest bending-moment is under the centre of gravity of the load. In Cases e, f, g, the point is at support.

The maximum bending-moment of any combination of the above conditions of loading would be their sum.

In Case c

$$P_e = \frac{W\,f}{l} \qquad (27)$$

$$P_f = \frac{W\,e}{l} \qquad (28)$$

[To be continued.]

AN ARCHITECTURAL COMPROMISE.

"Temperance," from the Tomb of Francis II, Duke of Brittany, Nantes Cathedral. From *L'Art pour Tous.*

IN politics, compromises have not always proved highly successful. Will they be any more certain to produce good results in architecture?

This may sound like an irrelevant opening for an architectural subject; and it would be irrelevant were it not that architecture is just now engaged in an internecine strife within itself, and that some of the conditions of political administration have been transferred to the domain of æsthetics, where they are producing very marked results in the execution of the artistic code. In other words, the policy of compromise has been carried into architectural administration, and it behooves us to know if compromises are apt to be productive of permanently good results, and if they do not generally end in a misfortune of some kind.

We have heard a great deal recently about the constructive merits of Chicago architects, and their performances have received the indorsement of some men of good qualifications as architectural critics. Their works are widely imitated, too, in other cities, by architects of reputation, and the drift of public opinion seems to be turning in their favor. Yet what is this Chicago idea when it is dissected, and what is its tendency, in the view of good taste, on the development of architecture? We must be careful to keep the line between architectural engineering and architectural design sharply drawn, if we wish to estimate the one at its true value as a handmaid and companion of design, and protect the other from the possible evil influences of its stronger, but, æsthetically, somewhat disreputable and less attractive sister. But all this may sound enigmatical; and it will be best to hasten forward to a more definite explanation, in order that the appropriateness of the opening paragraph may be clearly understood.

Some years ago, or many years ago it may now be said, the iron manufacturers came to the conclusion that iron might be made not merely a good structural feature of architecture but an exclusive building material for all parts of a structure above the foundations, and they were successful in convincing a great many persons that their idea was well conceived. Superficially, the arguments in their favor seemed overwhelmingly strong. As a building material iron appeared to be absolutely incombustible. It was easily moulded or cast into the semblance of plastic or sculptured art, and its great tensile strength permitted its use in buildings where light and ventilation were chief recommendations. Hence, long rows of iron fronts—nominally of iron, but chiefly composed of glass—sprang up along the traffic arteries of our chief cities; and it looked for a time as though the stone quarries and brick-yards were to be relegated to the realms of antique superstitions. A new building material was taking possession of the field, and if none of the quarrymen or brickmakers committed suicide, it is probably because these industries fail to cultivate those excruciating sensibilities that lead to tragedies of the kind.

Nevertheless, the innovation did not prove to be quite successful. Architecture as a member of the fine-art family is closely related to music, and it is subject to some of the same laws that control musical production. But as it has been proved that a Wagner may be the only great man in music until a Mascagni comes, so it also may finally be found that when our ears have been alternately stormed and charmed to the border of deafness by the two great masters we shall be ready to welcome a resurrection of a Meyerbeer and a Mozart. In other words, a brick was not made to be disregarded, whether it strikes us on the subcranial and æsthetic or supercranial side of the head; and it was possibly the consciousness of this fact which relieved the brickmakers from despondency in their hour of peril.

The danger to architecture, however, has not yet entirely passed. It was said, but now, that the iron innovation had not been quite successful; but the declaration must be qualified. The invader ha not yet abandoned the field. It carried the outpost, and, having m with a check, it proceeded to entrench itself in the structural par of the citadel and to demand a parley and a compromise. It wi relinquish its exclusive claims to the edifice if we will permit it t carry its structural features into the façade. It will even consent t bury itself, or the more offensive parts of itself, in the recesses o brick, where, by the way, it can find protection from the inclemenc of the weather, if we will only permit it to decree that the wall-fac shall still be composed mainly of glass, and the brick or stone sul divisions shall not be permitted to display their proportions to obtrusively. Can the architects, with their principles of architectur design in view, afford to accept the compromise and permit th measure of self-effacement which the acceptance of such terms wi compel? This is the question that must be answered now; an when we have discovered the place where the true architect mu draw the line between yes and no we shall have found in what wa the compromise can be considered without witnessing a decadenc in architecture.

Let us clearly understand the nature of the lack of adaptability i iron as an exclusive building material, and then we shall more clearl comprehend what the architects are called upon to surrender in i behalf, and how far the surrender can be made without an abandon ment of the highest architectural art, and the substitution of merely structural art in its place. Iron proved to be inimical t those combinations of lines and masses that enter into the highe architectural expression. Good taste demands the observance o certain proportions in building. The apertures must bear a definit relation to the wall-face, modified, it is true, in different examples o architecture, but still clearly defined, and not unprecedented in an good example, and columns, cornices and pediments must be sugge tive of a certain weight and symmetry derived from the subjectio of the details to the mass. The structure, in short, must hang togeth as a whole, and not look like the mere box-like enclosure of a ce tain number of cubic feet of space conceived without any artist motive.

For causes which it will not be worth while to specify here, iro failed of meeting these requirements. It refused absolutely to adap itself to the laws of proportion. It will be useless to say in repl too, that our ideas of proportion are borrowed from the materi long used in architecture, and that a new material might create new sense of proportion. The claim at best could be only a ha truth; for our sense of proportion has only in part been derived fro material, and it is in much larger part, probably, derived from th sense of mathematical ratios and a close observance of what may b called the æsthetic works of nature. Ruskin, though generally an a chitectural critic of the highest qualifications, was probably wrong i tracing a too close relationship between the sense of proportion an material. Wood has been a building material longer than eith stone or brick; yet we have seen all through its history that whe ever the builder in wood sought to give expression to any high ord of æsthetic sentiment he was compelled to imitate the ratios of bri and stone, and to be a follower instead of a leader in architectur design. The truth is, our sense of architectural proportion has se eral origins, some plain and palpable, and others, though subtile an hidden, none the less operative. It is certain that even light an shade enter so largely into the combinations that make grand propo tions that our cathedral architecture would have been develope along entirely different lines of evolution had the subtile forces o these two agents not wrought-in the combinations that contribu to the perfections of Gothic art. We have a world of nature a around us, in the rocks, the cliffs, the hills, the mountains, and th forests, which is continually impressing itself on our æsthetic sens bilities; and it would be impossible to say to what extent our em tions are derived from one source and to what extent from anothe We only know absolutely that they are inspired, and that they ca not be violated without producing some very discordant results.

Here is where iron failed in its first intrusion among the vario substances used as a building material. It came both as an imitat and a creator; and wherever it was an imitator it w. a burlesqu imitator, or, to use the term most appropriate in artistic discussion, caricaturist, and wherever it was a creator it was a creator that studie only the utilitarian and not the decorative side of architecture. B now it is demanding a compromise, and offering to render itself invi ible, or less obtrusive at least, provided only that we shall accep its principles and conform to its strictly structural regulations.

Unfortunately, however, for the success of the negotiations i progress, its principles and its regulations are precisely what we a unable to accept without degrading all other building material a most down to its own level. It would be a mistake to suppose th our chief quarrel with iron and our rejection of its first overture were due to its external features, however brazen they may hav been, or to any lack of polish in the mode of its presentation to th public. All these blemishes could have been endured and condone on account of its really fine structural qualifications, but its over tures were rejected because it brought in an exaggerated form th very vices which it is now asking us to embrace in a modified form It took the field in contempt of those well-established principles o proportion on which not only grandeur in architecture is dependen but from which even beauty cannot escape without disfigurement and it now asks us to compromise by conceding the excellence o

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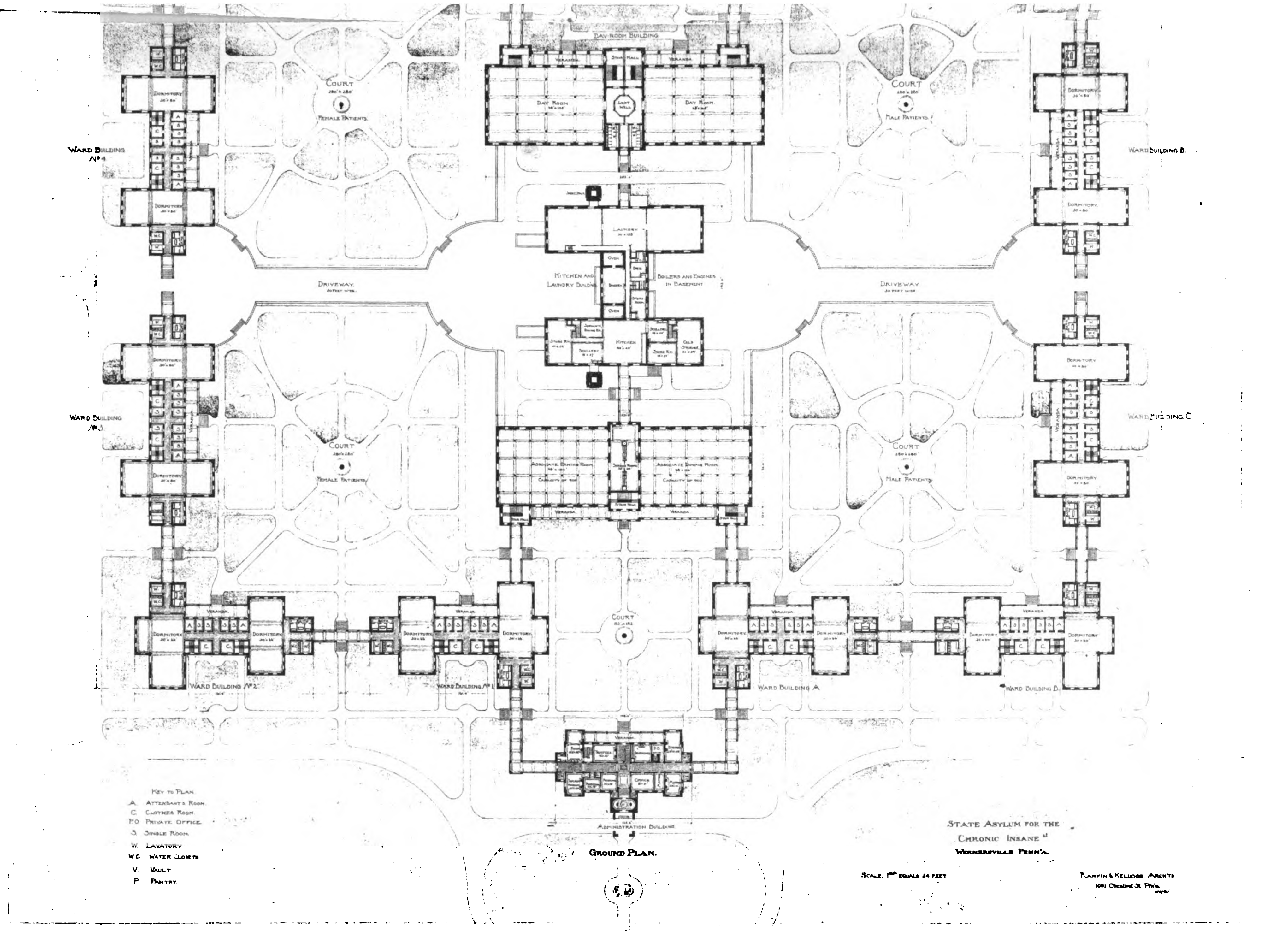
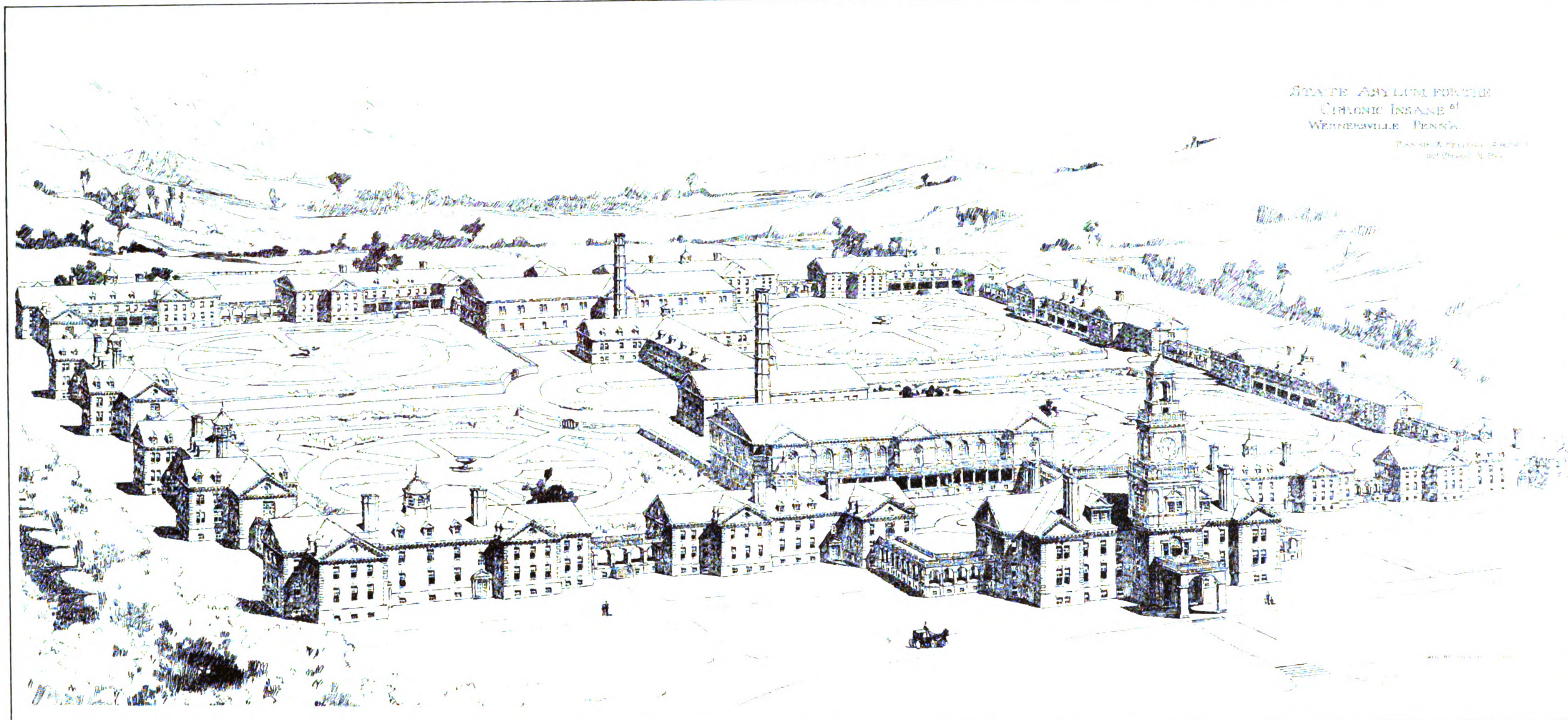
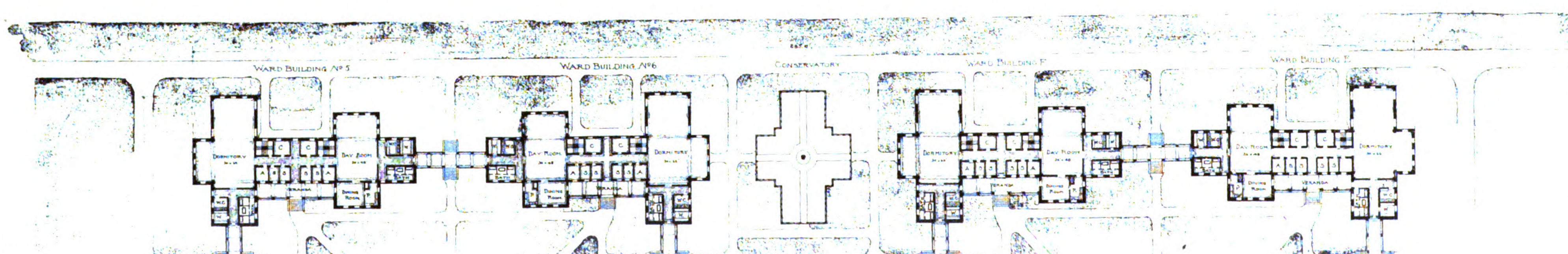
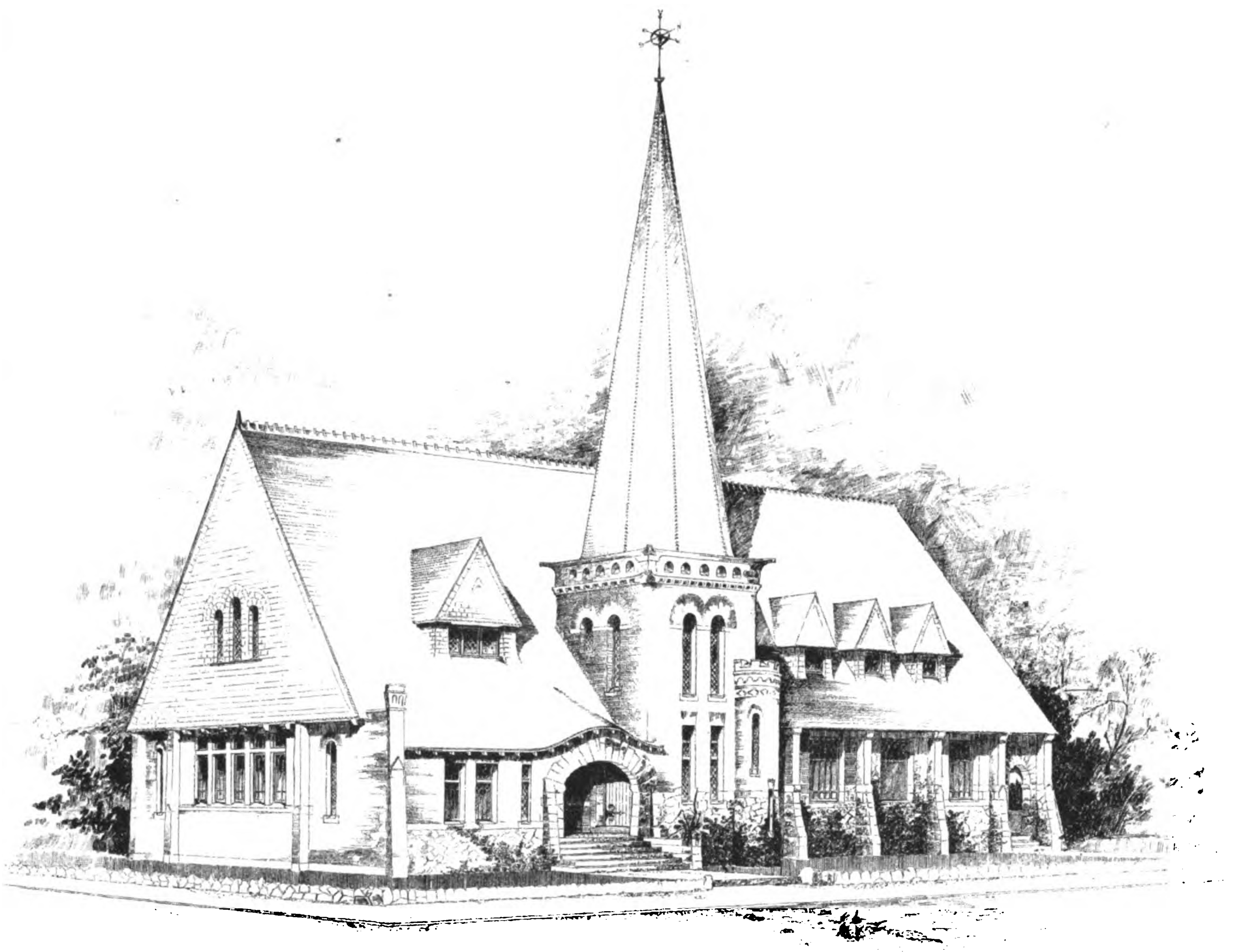


Day Room Building
Day Room
Day Room
Court
Female Patients
Court
Male Patients
Ward Building No 4
Ward Building B.
Laundry
Kitchen and Laundry Building
Boilers and Engines in Basement
Driveway
Driveway
Kitchen
Ward Building No 3
Ward Building C.
Court
Female Patients
Court
Male Patients
Associate Dining Room
Capacity of 500
Associate Dining Room
Capacity of 500
Veranda
Court
Ward Building No 2
Ward Building No 1
Ward Building A
Ward Building D.
Administration Building
Key to Plan
A. Attendant's Room
C. Clothes Room
P.O. Private Office
S. Single Room
W. Lavatory
W.C. Water Closets
V. Vault
P. Pantry
Ground Plan.
State Asylum for the Chronic Insane at Wernersville Penn'a.
Scale, 1 inch equals 24 feet
Rankin & Kellogg, Archts
1001 Chestnut St. Phila.

American Architect and Building News, Jan. 21, 1893.

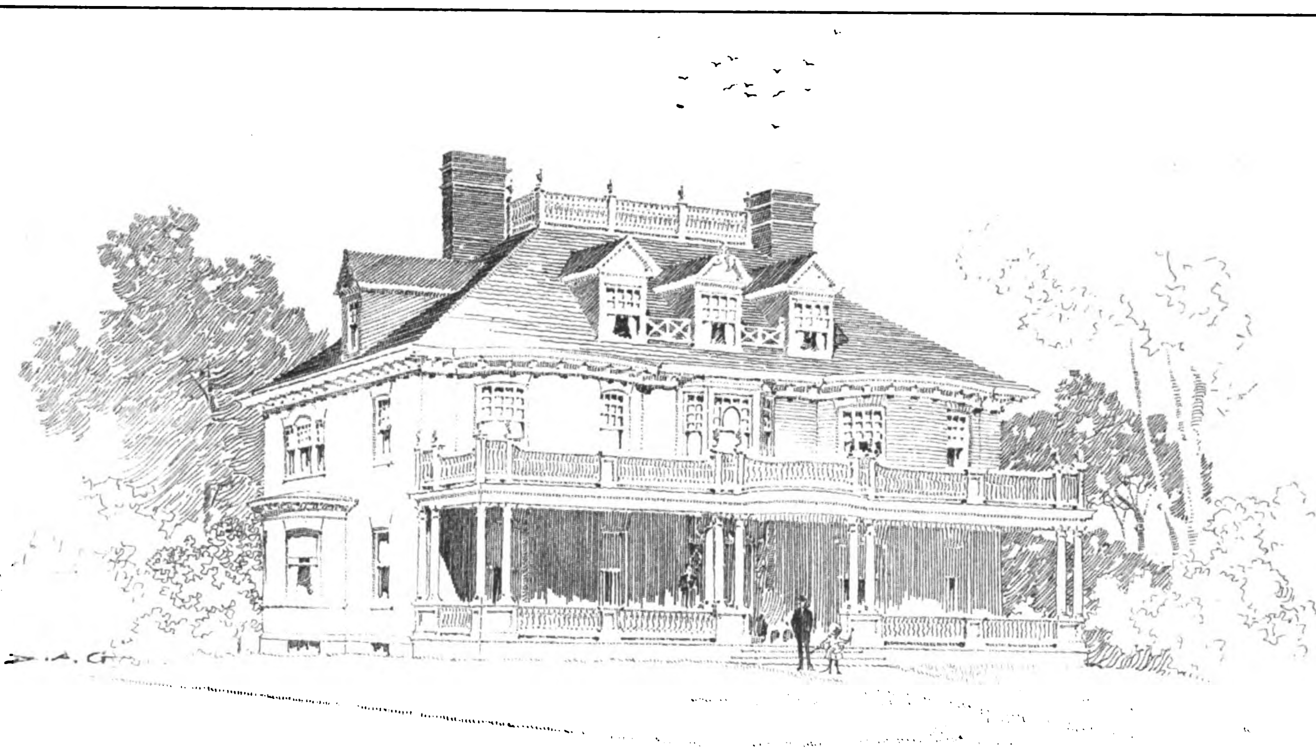






SKETCH FOR PROPOSED PRESBYTERIAN CHURCH

W. J. EAST ARCHITECT PITTSBURGH



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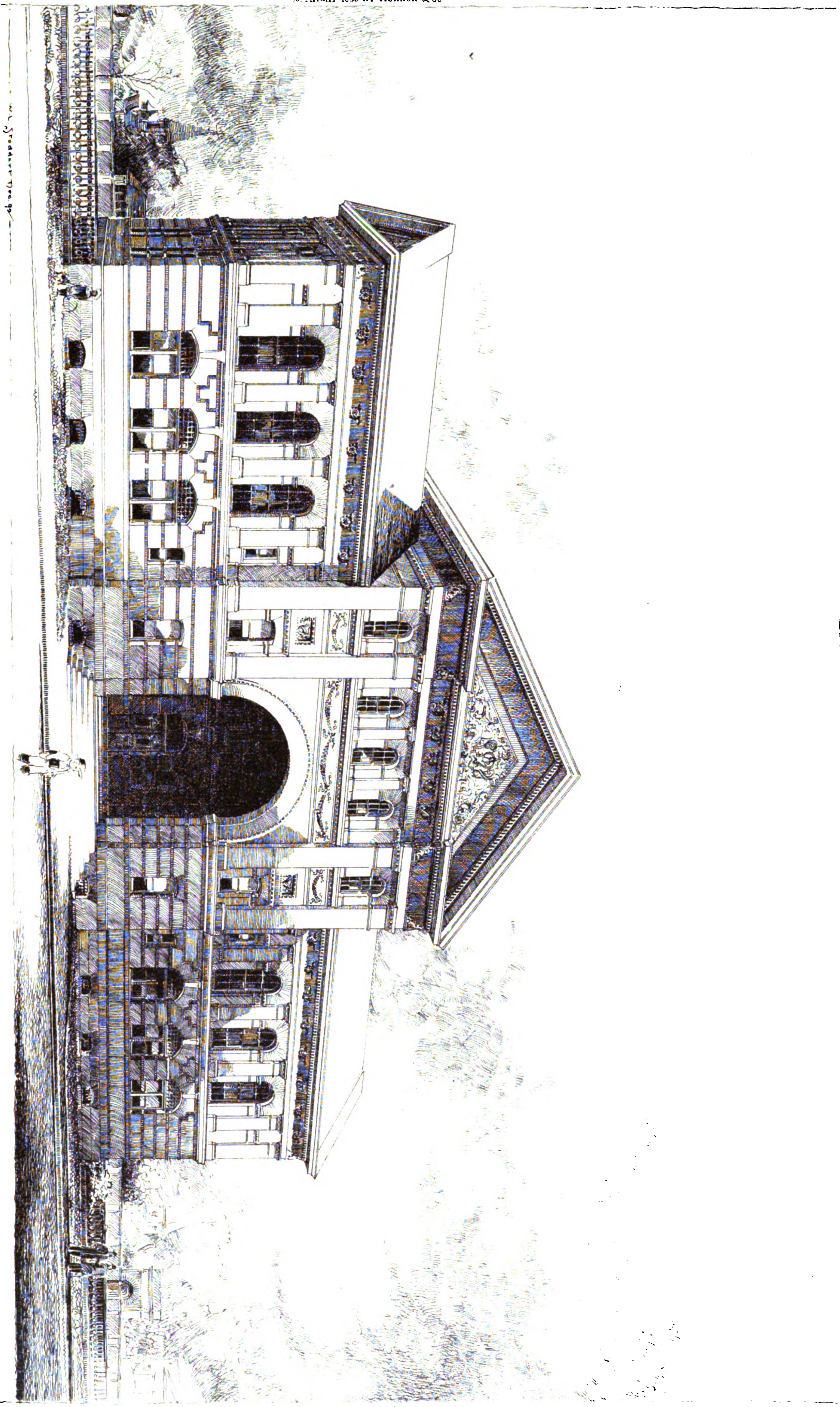

— Savannah Ga., Public School Building. — G. L. Norrman Arch't, Atlanta, Ga., —

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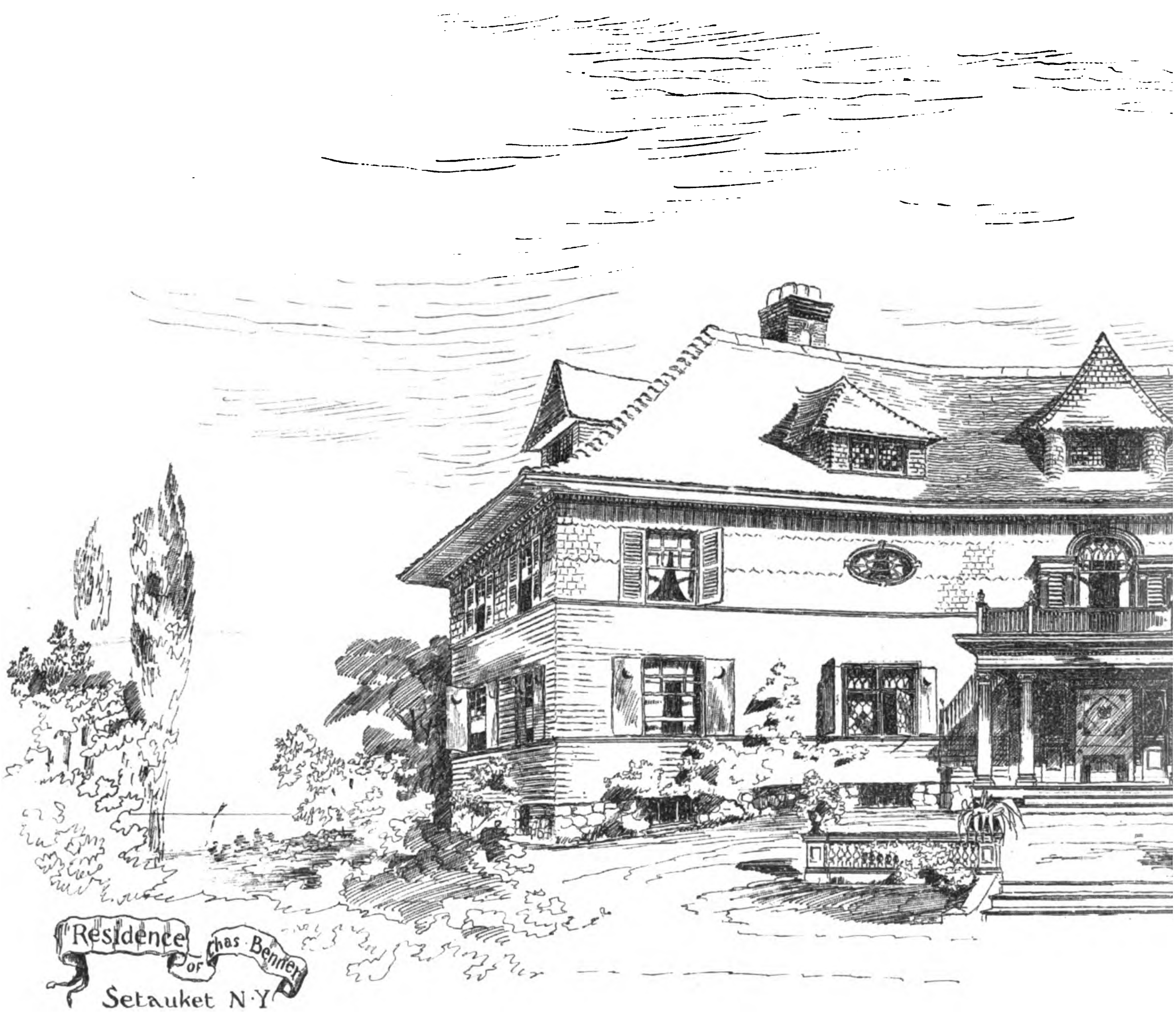

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its chief innovations. But is it any more compatible with good taste in the new service which it is seeking to render?

Well, yes; it may be admitted, possibly, that it is a little more compatible. It confesses to the artistic necessity of something broader than mere iron posts between apertures. It concedes that a wall-face, not inclusive of the windows and doors, may be expedient for decorative purposes, and it goes farther, and will help to sustain in place cornices and pediments of stone. True, it is not quite an honest material even in its concessions. In contending for the contraction of the wall-face to adapt the wall to its own structural requirements, it presses into service a system of lines and combinations of lines in which very massive and grand cornices and pediments would look disproportioned, thus nullifying some of the best fruits of its surrender. But it has left enough of architecture to enable the true architect to reconstruct the art in accordance with the established canons of taste, and it may, therefore, be credited with a higher degree of compatibility with æsthetic art than it originally manifested. But its overtures must still be accepted with great caution. It loses but little of its ability to outrage good taste by its partial withdrawal from observation, and the very subtilty of its movements renders it the more dangerous.

But now that this much has been said by way of a caveat to architects, may it not also be true that something may be said in favor of the new structural combination of iron, brick and stone? Unquestionably a great deal may be said in commendation. We could not build with too much strength, even were there no call for the greater elevation of buildings than five or six stories. But however desirable it may be, from many points of view, to restrict elevation, it is not probable that it can ever be restricted. The great concentration of population in large cities, and the possibly still greater concentration of a population demanding space in town that will be brought to the suburbs of large cities by improved and cheapened means of transit must continually cause the pressure upon building plans to be perpendicular rather than horizontal. It will not be prudent, therefore, to say that buildings will not continue to grow in altitude until all the resources of safe construction have been exhausted. Then, it will be in providing for this new demand that the combination may be made most useful. In the hands of men really competent as architectural designers, it may even be made a protection to the æsthetic features of architecture and help to avert a danger which must already be pronounced as more than threatening in its manifestations on some of the most elaborate and expensive of recent architectural examples. What is the nature of this danger?

It can hardly have failed to strike the critical observer for a number of years past that something discordant was creeping into our most ambitious architecture. Our best structures were continually becoming more and more massive in effect; but at the same time they became neither more grand, more dignified, nor more beautiful. On the contrary, they seemed to be losing rather than gaining in all three qualities; and, to increase the measure of their defects, they were pervaded by a certain air of gloom that was oppressive rather than inviting. On rambling through some of the lower districts of New York, where the structures are of the most elaborate description, an impressionable spectator could hardly resist the feeling that he was in a neighborhood of highly decorated bastiles, attractive enough if he kept his eye upon the façades, but suggestive of dungeons, if not of the thumb-screw and the rack, when he allowed his vision to wander through the open portals. Within, everything seemed dark and forbidding, and the sickly gleam of gas or electric lights at noonday only added a Plutonic aspect to a spectacle already sufficiently suggestive of the nether world. Evidently, architecture, like the full moon at times, was moving behind a cloud, and its light was becoming hidden from mortal vision.

The truth is that, in attempting to climb higher and higher, brick and stone had finally climbed so high that structural necessity compelled them to violate some of those same rules of proportion that iron has always violated in mere wantonness. True, they erred upon the other side, and had not yet departed far enough from the true ratios in proportion to make their combinations hideous; but they had departed far enough to show that true art will surrender nothing to either structural necessity or caprice, and that the moment material begins to impress itself upon the conceptions of the architect she will fly away, and fly so far that she can be won back only after prolonged and painful endeavor.

Here, then, is the conclusion of the whole matter: In the structural union of iron, brick and stone we have found a combination that will enable us to build to a great elevation without compelling us to sacrifice our sense of æsthetic proportion. But it is a combination, at the same time, which enables architects to walk dangerously close to the verge of too great lightness and frivolity, and which thus far seems to have displayed chiefly a faculty for toppling them over into the abyss. True architects will accept no compromises so long as their employers will permit them to put fine art before constructive art, and build in accordance with the true principles of design. They have nothing to learn from iron, and no artistic deductions to draw from its use. At the best, it is only an enabling material. In buildings that are low enough to be built without any violation of proportion, its reinforcement to the wall will not be needed; and in buildings that demand its use it should have no influence after the true proportions are secured. Unquestionably, under the new system of construction, the walls of very tall buildings will be somewhat thinner than they would have been had there been no improvement in constructive processes; but they should not be reduced in thickness because iron permits the reduction. They should be reduced only because the old processes of construction sometimes caused them to be made disproportionately thick. There is no suggestion of solidity or strength in most of the buildings now under construction by the new process, and when we have lost this suggestion we have lost one of the chief elements of the classic in architecture.

Doubtless, it will be a nice thing for an architect to draw the line between what he could do as a constructor and what he ought to do as an artist; but if he is a man of the true feeling it should not be difficult. His greatest difficulty, it is to be feared, will be found in his lack of liberty. The potency of estimates on cost is something quite overwhelming. WILLIAM NELSON BLACK.

SIX HOURS IN SALEM.

On Gallows Hill.

THE material for the accompanying drawings and sketches, and the following facts, relative and irrelevant thereto, were all collected by the present writer and a friend in a six-hour long visit to Salem, supplemented by a short preliminary cramming at the Boston Library on the evening previous. In so short a time, and with imperfect facilities (our only instruments were note-books, rules, and pencils, and a kodak camera), it is perhaps presumptuous to suppose that much of fresh interest or of permanent value could be gathered in a field already so well harvested by such men as Arthur Little, Frank Wallis and others not less competent, but it so happened, partly by accident and partly also from design, that we devoted our attention principally to houses not treated before. In so doing we have hoped not only to escape comparisons, sure to be disastrous, but also to augment, in some slight degree, the sum total of drawings and documents pertaining to Colonial architecture in America.

In the popular mind, Salem is so indissolubly associated with the idea of witchcraft that in any article on the subject, however practical its nature or prosaic its style, it would be impossible not to refer in passing to that insane delusion, the horrid and bloody results of which have made the town famous not in the history of the country merely but of humanity at large. Indeed, the tragedy enacted there two centuries ago colors the life of the place to-day, and, like a murderer's conscience, clamors for recognition. There is a sinister something in the names one hears, such as the "Witch House" and "Gallows Hill"; the very word "witch," which once struck terror to brave hearts, is used now by tradesmen to enhance the value of their wares. In the court-house are still to be seen the documents relating to the trials, and objects used as evidence thereat; among them the "witch-pins" with which the accused were supposed to have tormented their victims. On the corner of Washington and Lynde streets we came upon a black bronze tablet bearing the following inscription:

> "Nearly opposite this spot stood, in the middle of the street, a building devoted from 1677 until 1718 to municipal and judicial uses. In it, in 1692, were tried and condemned for witchcraft most of the nineteen persons who suffered death on the gallows. Giles Corey was here put to trial on the same charge, and, refusing to plead, was taken away and pressed to death. In January, 1693, twenty-one persons were tried here for witchcraft, of whom eighteen were acquitted and three condemned, but later set free, together with about 150 accused persons in a general delivery which occurred in May."

It was like encountering a funeral on the street, and, hurried and preoccupied as we were, we could not but pause, and try to realize, if only for an instant, the terror which ruled the community when husbands accused wives, children and parents, and safety lay neither in wealth nor station — least of all in innocence — and fear and cowardice passed like a pestilence from heart to heart.

In reading over the reports of the witch trials one is afflicted by a feeling of something uncanny in it all, and is tempted to believe in witchcraft — obsession by evil spirits, and the rest; but time has strangely reversed the positions of accuser and accused, for now it is the judges who appear to be the vehicle of the diabolic will, so blind and implacable they seem — so intent on having the blood of their victims. I call to mind a single instance which will suffice in illustration of this: One of the afflicted girls said that Sarah Good, then on trial, had cut her with a knife and broken the blade in her flesh. Search was made, and, sure enough, the blade was found on Sarah's person. A young man, thereupon, got up and exposed the fraud. He produced the rest of the knife, and told how he had thrown the broken blade away in the presence of the girl; but the Court, instead of admitting his evidence, dismissed him with an admonition not to tell lies and continued taking the testimony. What wonder that justice such as this wrung from Martha Corey the pathetic protest: "You are all against me and I cannot help it!"

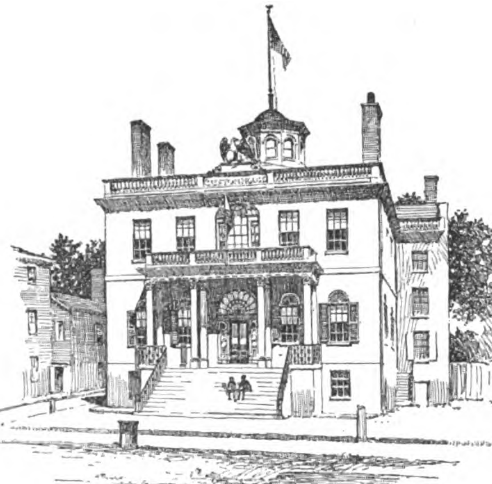
Next to its having been the centre of the witchcraft delusion, Salem is perhaps most famous as the birthplace of Nathaniel Hawthorne and the supposed scene of many of his romances. The house where he was born, and others in which he lived at various times, may still be seen by the curious visitor, and so intermingled do the real and the ideal become with the lapse of time that one of the principal "objects of interest" is a house supposed to have been the original of the "Seven Gables," though there is little or no evidence in support of such an assumption. Whatever may have once been its condition, it certainly tallies ill with Hawthorne's description; and of gables we counted only two. The Pickering house came much nearer our ideal — even to the magnificent old elm before the door.

Pickering House.

These two are about the only remaining examples of the many and steep-gabled houses, built here in the middle of the seventeenth century, in evident imitation of the Gothic half-timbered cottages of England.

We visited the Custom-House, where Hawthorne served a term in the capacity of Surveyor of the Port, an experience which he subsequently immortalized in his introduction to the "*Scarlet Letter.*" The place looks to-day exactly as he there describes it:

"In my native town of Salem, at the head of what, half a century ago, in the days of old King Darby, was a bustling wharf, — but which is now burdened with decayed wooden warehouses, and exhibits few or no symptons of commercial life; except, perhaps, a bark or brig, half way down its melancholy length, discharging hides; or, nearer at hand, a Nova Scotia schooner pitching out her cargo of firewood, — at the head, I say, of this dilapidated wharf, which the tide often overflows, and along which, at the base and in the rear of the row of buildings, the track of many languid years is seen in a border of unthrifty grass, — here, with a view from its front windows adown this not very enlivening prospect, and thence across the harbor, stands a spacious edifice of brick. From the loftiest point of its roof, during precisely three and a half hours of each forenoon, floats or droops, in breeze or calm,



Custom-House.

the banner of the republic; but with the thirteen stripes turned vertically, instead of horizontally, and thus indicating that a civil, and not a military, post of Uncle Sam's Government is here established. Its front is ornamented with a portico of half a dozen wooden pillars supporting a balcony, beneath which a flight of wide granite steps descends towards the street. Over the entrance hovers an enormous specimen of the American eagle, with outspread wings, a shield before her breast, and, if I recollect aright, a bunch of intermingled thunderbolts and barbed arrows in each claw."

Fresh from a reperusal of Hawthorne's description of his life there, we tried to imagine him as still an incumbent of the post, going about his accustomed duties, and we almost duped ourselves into believing that we would see his familiar figure within each newly opened door. There was little to discourage such a fancy. For aught that we could see, he might have left there only yesterday. The same superannuated sea-captains, apparently, slouched about the corridors, calling one another "Cap," and discussing the last or coming "clam-fry," just as they did when Hawthorne passed among them like a prince disguised among his poor, — he alone conscious of his rank and power, and waiting till the time came to declare it. One of the above-mentioned dignitaries showed us the window at which Hawthorne worked, and the chamber in which he found the scarlet letter (if he ever found it, except in a chamber of his brain), in a manner which showed it to be an accustomed service.

The building itself, erected about the beginning of the century, impressed us as a fine example of later Colonial architecture, full of dignity and repose, and, though scarcely larger than some of the houses with which it is surrounded, expressing in unmistakable and appropriate terms its character and office.

Hawthorne is by no means the only illustrious son of Salem. Prescott was born here; here Roger Williams taught and preached, and here Count Rumford kept a store. Washington and Lafayette both visited the little town in the stirring Revolutionary days, and almost all of the presidents since. It is said that the first armed resistance to British authority occurred at the North Bridge in an engagement known as "Leslie's Retreat." In the war of 1812 the battle between the "*Chesapeake*" and the "*Shannon*" was fought off the shore of Salem, so that it could be witnessed by the townspeople from the hills.

Salem Back-yard.

But more interesting to us than the town's history were the lovely old houses of which it is built up. It was to see them that we had come and to this purpose therefore we devoted our remaining-time. To the mind of an architect the buildings of Salem arrange themselves naturally into three classes: First, those very old houses, built by early settlers in the most primitive times, possessing all the dignity and simplicity and, withal, the barrenness of the Puritan character, and around which cluster many strange, true histories and curious traditions; second, those built in later Colonial and Revolutionary days, usually by rich merchants and ship-owners, when Salem had become a principal port of entry, and an important commercial centre, and in which the Colonial style is exhibited in its very flower; and third, those purely modern structures — confused, chaotic — which have sprung up in profusion in some parts of the town, like weeds in an old-fashioned garden.

The very oldest house of all, as well as the most famous, is the Roger Williams house, on the corner of Essex and North streets. The exact date of its building is not known, but it cannot be far short of three centuries ago, for in 1675 the chimneys had to be taken down and rebuilt. It again suffered alteration in 1746, and now a vulgar little modern drug-store grows out of its withered old side, like some excrescence, indicative of age and disease and swift-coming dissolution. The western portion, with its quaint, overhanging second story, is almost all that remains of the original structure, but from it, in imagination, one may reconstruct the whole.

In 1635 this house was the home of Roger Williams, and from it he was driven by Puritanical intolerance to seek shelter among the Indians at Narragansett Bay, where he founded the State of Rhode Island, as every school-boy knows. In a letter to his friend, Major Williams, he thus refers to the event which drove him thither:

"When I was unkindly and unchristianly, as I believe, driven from my house and land and wife and children (in the midst of a New England winter now about thirty-five years past) at Salem, that ever honored Governor, Mr. Winthrop, privately wrote to me to steer my course to the Nahigonset Bay and Indians for many high and heavenly and publike ends encouraging me from the freenes of the place from any English claims or patents. I took his prudent motion as an hint and voice from God, and waving all other thoughts and motives I steered my course from Salem (through winter snows which I feel yet) into these parts where I may say Peniel, that is, I have seene the face of God."

The house passed then into the possession of Captain Richard Davenport, whose administrators sold it in 1675 to Jonathan Corwin, notorious as being one of the two magistrates before whom were tried and condemned those first persons, "charged with certain detestable arts called witchcraft and sorceries wickedly and feloniously used, practiced and exercised by which the persons named were tortured, afflicted, pined, consumed, wasted, and tormented." The preliminary examinations of some of the accused are said to have taken place in a room of the old house, and this circumstance has given it the name of the "Witch House," by which it is best known.

In rumaging over some old files of the *Essex Institute Bulletin* in

the Boston Library I came upon a transcript of the contract between Corwin and one Daniel Andrewe for remodelling the house. I give it here entire. As an example of an early specification, it will be seen to possess all the diffuseness and obscurity common to such documents at the present time:

"The said Daniel Andrewe is to dig and build a cellar as large as the easterly room of said house will afford (and in the said room according to the breadthe and length of it) not exceeding six foot in height: and to underpin the porch and the remaining part of the house not exceeding one foot; the said kitchen being 20 feet long and 18 foot wide; and to make steps with stones into the cellar in two places belonging to the cellar, together with stone steps up into the porch. 2. For the chimney he is to take down the chimneys which are now standing, and to take and make up of the bricks that are now in the chimneys, and the stones that are in the lean-to cellar that now is, and to rebuild the said chimney with five fire-places viz:, two below and two in the chambers and one in the garret; also to build one chimney in the kitchen with ovens and a furnace, not exceeding five feet above the top of the house 3. He is to set the jambs of the two chamber chimneys and of the easternmost room below with Dutch tiles, the said owner finding the tiles; also to lay all the hearths belonging to the said house and to point the cellar and underpinning of sd. house and so much of the hearths as are to be laid with Dutch tiles the said owner is to find them. 4. As for lathing and plaistering he is to lath and siele the four rooms of the house betwixt the joists overhead and to plaister the sides of the house with a coat of lime and haire upon the clay; also to fill the gable ends of the house with bricks and to plaister them with clay. 5. To lath and plaister the partitions of the house with clay and lime and to fill, lath and plaister the porch and porch chambers and to plaister them with lime and haire besides; and to siele and lath them overhead with lime and to fill, lath and plaister the kitchen up to the wall plate on every side. The said Daniel Andrewe is to find lime, bricks, clay, stone, haire together with labourers and workmen to help him, and generally all the materials for effecting and carrying out of the aforesaid worke, except laths and nails 7. The whole work before mentioned is to be done finished and performed att or before the last day of August next following provided the said Daniel or any that work with him be not lett or hindered for want of the carpenter worke. 8. Lastly, in consideration of the aforesaid worke, so finished and accomplished as is aforesaid, the aforesaid owner is to pay or cause to be paid unto the said workmen the summe of fifty pounds in money current in New England, to be paid at or before the finishing of the said worke. And for the true performance of the premises, we bind ourselves each to other, our heyeres, executors and administrators, firmly by these presents, as witnesse our hands, this nineteenth day of February, Anno Domini 1674–5

JONATHAN CORWIN
DANIEL ANDREWE"

The meeting-house in which Roger Williams used to preach — the first for congregational worship built in America — has been carefully restored and preserved, and stands now in the rear of the Essex Institute. The frame is about all that remains of the original building. It is so small that a person reaching forward from the front of the gallery might touch the extended hand of the minister behind the desk. It is used as a repository for many curious relics, among them Hawthorne's desk, at which the "*Scarlet Letter*" was written, or at least begun.

The Pickering house, before alluded to, is also of great antiquity, having been built in 1651 by John Pickering, and inhabited ever since by his direct lineal descendants. For this reason, perhaps, it betrays few evidences of the ravages of time. There are other houses in Salem, built about the same time, which, though interesting historically, present few attractions to the lovers of architectural beauty. It was for those built about the year 1800 that we reserved our admiration and our lead-pencils, — great square structures, usually of brick and stone, with wooden cornices and porches. One of them, typical of the whole class, especially arrested our attention by the beauty of its proportions and detail. Standing a little back from the street, and apart from its neighbors on either side, it displayed a façade plain almost to barrenness, but so well fenestrated

Pingree House.

and divided horizontally by broad bands of brickwork at each floor-level as to quite fill and satisfy the eye. This wall was finished with a well-proportioned cornice, and this, in turn, surmounted by a delicate balustrade. The only other bit of ornament consisted in one of those dainty and beautiful semicircular porches before the entrance, of which we saw so many in Salem. Through the courtesy of its occupants, we obtained admission to this house, and made drawings of much of its interior woodwork, which was both rich and refined. It was while so engaged that we first learned that the house had been the scene of one of the most horrible murders in all the history of crime, known at the time of its committal as the "Salem Murder," and celebrated alike for its cold-blooded brutality, the high position of many of the individuals concerned, and the singular succession of fatalities which accompanied and followed it. The facts are, briefly, these:

Typical Salem Frame House.

In a room of the old house, on the night of the 6th of April, 1830, Capt. Joseph White, a rich and respected citizen of Salem, was stabbed and beaten to death, as was alleged, by his nephews, George and Richard Crowninshield, and an accomplice, in order, it is supposed, to obtain possession of the old man's will. When the crime was discovered, the whole countryside was aroused, a great public meeting held, and the murderers apprehended and hunted down. In the trials which followed, some of the greatest lawyers in the country participated, among them Daniel Webster and Samuel Hoar. The jury failed to agree, and so the trials came to nothing; but they were full of startling and dramatic incidents. Chief Justice Isaac Parker, immediately after delivering his charge to the jury, fell forward, dead, and one of the Crowninshields killed himself in jail while awaiting trial. The other, Richard, was the inventor of some of the most intricate machinery used in the factories of New England to-day.

This tale, when we heard it, somehow dampened our architectural ardors. At this window, we reflected, where now the sun streamed so brightly in, the assassin entered; these floors creaked warningly beneath his stealthy feet, and then were treacherously still; this spotless white woodwork had been crimsoned by the old man's blood; these walls resounded with his dying groans. We did not care to linger after that, but tiptoed down the broad stairs and through the still hall out into the welcome noise and glare of Essex Street.

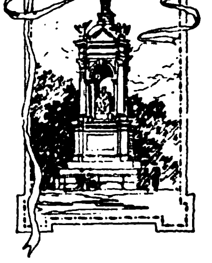
The Essex Institute was just next door, and we spent half an hour very pleasantly in the museum, where there are many pieces of fine old furniture and woodwork taken from houses now destroyed. We found fine furniture, also, in the house of Major George Whipple, and the first "Salem cupboard" that we had ever seen.

A little beyond the Essex Institute is the armory of the Salem Cadets, a stately old house built by Col. Francis Peabody in 1818. Its front is diversified by two segment-shaped bays, in this respect a departure from the usual Salem type, though a common feature of many old houses in Boston. The interior is more than ordinarily grand, one room containing a white marble mantel with carved caryatides. Off of the stair-landing is a banqueting-hall finished in oak in Elizabethan Gothic, where, we are told by the guide-book, "Prince Arthur of England was entertained at dinner on the occasion of his attending the funeral of George Peabody, the banker, February 8, 1870." This rich, dark, elaborate interior is in startling contrast to the trim white Colonial finish of the rest of the house.

We left Salem for Boston about three in the afternoon, with such feelings of regret as must have been Sinbad's on quitting the Valley of Diamonds, for, to our unaccustomed Western eyes, the place seemed a veritable mine of architectural wealth. The permanent impression left with us by our hasty visit was of an exceedingly quaint and picturesque old town, striving here and there to be "smart" and modern, like some faded spinster who has seen better days, who mistakenly prefers our shoddy fabrics to the faded silks and yellow lace and other heirlooms of an opulent past. The old houses which we visited, redolent with memories of other days as a rose that has been kissed and laid away, awoke in us a mood of pleasant melancholy full of vague guesses and conjectures. It was as though the houses themselves were trying to communicate to us their secrets, and had half succeeded. They seemed, indeed, human in a way that modern houses never do,— like the Colonial dames, their mistresses,— trim, plain, and a bit prudish in outward appearance, but interiorly beautiful, full of fine and delicate sentiment. This comparison, fanciful, perhaps, is yet applicable to the old houses of the South, which occupy their acres more invitingly, with less restraint, and are, altogether, more charming outwardly, like the Southern women, yet, within, are not without a certain strain of coarseness, the result of the idle, luxurious living and the languid air.

CLAUDE FAYETTE BRAGDON.

A STONE ELEPHANT. — An Indiana stone quarry company is having a life-size figure of an elephant chiseled out of a solid block of stone. It will be eleven feet high and weigh thirty tons. It is designed for the World's Fair. — *Exchange.*



THE SUGGESTED ARCHITECTURAL EXHIBITION. — THE FRENCH HOSPITAL COMPETITION. — THE STARR KING AND OTHER STATUES. — THE DEPOT MATTER.

SINCE I last wrote you, little in the way of architectural gossip has transpired in the city, but it may even be well for you to know what we are not doing. "The best-laid schemes o' mice and men gang aft a-gley"; and so, I am afraid, it has been with a proposition put forward some months ago to get up an exhibition relating to architecture and the kindred arts. The scheme, among a few who were good at talk, took form rapidly, until the range of its embrace extended to the horizon, and, reflecting backward, finally became concrete in the form of a dinner, at which about twenty out of a possible hundred architects were present. It is almost unnecessary to say more. The architects, old and young — mostly those at the two extremes of life — met: on the one hand, those too old to vivify new projects, and, on the other, those whose enthusiasm would lead them to undertake the building of anything without counting the cost. Lockless age and beardless youth met, ate, told stories and made merry. One orator alone thrilled with the passion of his art, but his voice was as one crying in the wilderness "*Prepare!*" Yes, in the future we may have such an exhibition, but not just yet. The idea is an excellent one — to have an exhibition of architectural drawings, photographs, artistic metal and wood work, decoration, stained-glass, and all the artistic arts that relate more or less directly to architecture. It has been done in other cities, and we have no doubt that, if the right persons would take the scheme in hand and set it going, the public would, in a few years, so patronize such exhibitions as to make them self-supporting.

In the matter of competitions, we have had quite an important one in the French Hospital.

It is the privilege of an architect to be intimately sympathetic with every joy and sorrow that thrills the human heart, and as, in designing a place of amusement, he may allow his spirits to be gay even to the point of frivolity, so, in designing a hospital, must he be as sympathetic in his tenderness as a woman, if he would lay his square and triangle in such a manner, on his part, that the pain and weariness of sickness and disease may be more easily borne. The directors of the hospital were wise beyond measure in the manner they went about arriving at what they desired. First, they employed one of the leading architects of the city to prepare them a number of preliminary drawings, from which, by study and criticism, they might outline in the form of conditions of competition this partially perfected ideal arrangement.

The competition was then thrown open to the public. They proposed covering a lot, surrounded by streets, 240 x 600, with, approximately speaking, eight wards, an administration-building and culinary department, to accommodate about 150 patients; the buildings to be of brick or other non-combustible materials, with all the most approved hygienic appliances, and to cost not more than $180,-000. An interior court for convalescents, where they might bask in the sun, sheltered from the rigorous trade-winds that bluster over our city half the day for more than half the year, was considered most desirable. Each ward also had to be detached and separated from all adjoining buildings by once-and-a-half the height of such buildings.

The problem of a hospital is never an easy one, and especially as, in this case, the ground space was insufficient. However, Mr. Mooser, of this city, in conjunction with, presumably, an expert of Paris, has been successful in satisfying the needs of the Board of Directors. His plan is similar in its fundamental lines to those which undoubtedly come nearest the mark. At the centre of one end of the lot is placed the administration-building; flanking it, and stretching the full length of the available ground space, are arranged the eight main wards on either side, with the kitchen department in the centre of the lot. The space between these two rows of buildings is occupied by a garden for the use of patients.

The buildings are two stories in height, besides a basement, and appear cheerful in elevation, although not in any way architectural. The style is essentially "cottage architecture, nineteenth-century" in its dry utilitarianism, and, for what little interest is attached to it, depends wholly on the manner in which many-colored bricks are banded and interlarded in various ways. It will appear modest and unassuming, but is altogether too finicky for many tastes.

Several of the other designs were far more pleasing in their bold simplicity; but a hospital is a plan essentially, and on that alone must we decide. A week more nearly than an hour would be required to weigh the *pros* and *cons* of these many plans, and so judgment is reserved. Suffice it to say that the directors were well qualified, and that they gave a careful and therefore valuable judgment. Sixteen sets of drawings were submitted.

Unlike Rome in her palmy days, we have fewer statues than inhabitants in the city of San Francisco, for which, of a truth, we have much to be thankful, else would we rapidly forget the human form divine, and think only of it in that grotesque form in which man has fashioned it — not after the image of God, but after something that has no counterpart either in heaven above or in the earth beneath. San Francisco boasts of her park, and, in her pride, would adorn it with statues, if she knew how. The latest addition, however, which was unveiled a few weeks ago, has not about it the touch of genius, or, if so touched, then so lightly that the vulgar eye cannot detect it. Starr King, a philanthropist of this city, is the one chosen to be immortalized. It is continually being said that it is difficult to make out of a nineteenth-century individual in the costume of a civilian anything that will move the human heart; but why should it be so? Are we not impressed every day of our lives by just such men, though on them, we admit, is no romantic dress, but still true men? So on that score I will not excuse the sculptor. Starr King stands on his pedestal, steadying himself by his left hand with a Roman quiver of arrows, a thing which does not belong to a realistic study in this century. He is dressed in modern style, and holds in his right hand, in rather an aimless manner, a something that appears like a scrap of sheet-iron, which supposedly is a scroll. From his shoulder has fallen his mantle; but the man and this manner of disrobing do not agree. The Park Commissioners may, however, enjoy quietude of mind in so far as they may rest assured that this statue will not become unstable, as did the fair creation of Pygmaleon. We have several others of this kind about town, notably that of Garfield; but, as an offset, we have that which, to me, is most poetic, the Scott Key monument, with its dreamy, restful-looking occupant sitting in his student's chair, gathering, as it were, from the inner realms of nature, those thoughts which he has so majestically expressed in our great national song. The "Ball-thrower" is a horse of a different color, and is a bound from the mental to the physical side of nature; but the keen eye and strengthened limbs of a sturdy young man when and all but ready to throw is well expressed.

In actual building operations, we have at present nothing important to relate. The hoped-for demand for new mammoth fireproof buildings to take the place of low two and three story frame and brick buildings seems to have exhausted itself for the present. Still, we may content ourselves in the thought that, if we do not progress as rapidly as some of our Eastern sisters, our progress may be equally satisfactory.

In time, we are to have a new building in place of the present shed-like structure, that so poorly accommodates the travelling public at our principal point of arrival and departure, and gives so bad a first impression of San Francisco. Five hundred thousand dollars are to be expended, and, if we can judge by the slowness of the gods in expending their money, we ought to expect something very fine.

MEETING OF BOARD OF DIRECTORS A. I. A., IN WASHINGTON, TO CONFER WITH COMMITTEE ON PUBLIC BUILDINGS AND GROUNDS OF THE U. S. SENATE IN REFERENCE TO AWARDING GOVERNMENT BUILDINGS BY COMPETITION.

ON Friday, March 11, 1892, the Committee on Public Buildings and Grounds, U. S. House of Representatives, gave a delegation of architects from various sections of the country a hearing. The result of this hearing was a strong report [1] by the House Committee in favor of the following bill:

52D CONGRESS, 1ST SESSION, H. R. 9592.

IN THE SENATE OF THE UNITED STATES, JULY 19, 1892.

Read twice and referred to the Committee on Public Buildings and Grounds.

AN ACT

Authorizing the Secretary of the Treasury to obtain plans and specifications for public buildings to be erected under the supervision of the Treasury Department, and providing for local supervision of the construction of the same.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

That the Secretary of the Treasury be, and he is hereby, authorized in his discretion to obtain plans, drawings, and specifications for the erection of public buildings for the United States, authorized by Congress to be erected under the supervision and direction of the Secretary of the Treasury and the local supervision of the construction thereof by competition among architects under such conditions as he may prescribe, and to make

[1] Report No. 1078, House of Representatives, 52d Congress, First Session, to accompany H. R. 8152.

payment of expenses and for the services of said architects out of the appropriations for the respective buildings: *Provided*, That not less than five architects shall be invited by the said Secretary to compete for the furnishing of such plans and specifications and the supervision of such construction: *And provided further*, That the general supervision of the work shall continue in the office of the Supervising Architect of the Treasury Department, the Supervising Architect to be the representative of the Government in all matters connected with the erection and completion of such buildings, the receipt of proposals, the award of contracts therefor, and the disbursement of moneys thereunder, and perform all the duties that now pertain to his office, except the preparation of drawings and specifications for such buildings and the local supervision of the construction thereof, the said drawings and specifications, however, to be subject at all times to modification and change relating to plan or arrangement of building and selection of material therefor as may be directed by the Secretary of the Treasury.

Passed the House of Representatives, July 18, 1892.

Attest: JAMES KERR, *Clerk*.

The bill as passed by the House is a modification of the original bill presented in January, 1892, H. R. No. 8152.

On Tuesday, January 10, 1893, the Directors of the A. I. A. met in Washington, transacted their routine business, and by appointment met in the room of the Senate Committee on Public Buildings and Grounds to confer with them in reference to the bill which passed the House. (See *American Architect*, April 2, 1892.)

The meeting was adjourned to Tuesday, January 12, 1893, and the following memorial was submitted to the Senate committee and signed by the architects who were present at the meeting.

WASHINGTON, D. C., January 11, 1893.

TO THE HONORABLE, THE COMMITTEE ON PUBLIC BUILDINGS AND GROUNDS, UNITED STATES SENATE, WASHINGTON, D. C.:—

Gentlemen,— We, the undersigned architects from various States of the Union, and officers and members of the American Institute of Architects, assembled in Washington to meet your committee to urge the passage of H. R. 9592: "An Act authorizing the Secretary of the Treasury to obtain plans and specifications for public buildings to be erected under the supervision of the Treasury Department and providing for local supervision of the construction of the same."

And finding that owing to the indisposition of your acting Chairman the hearing for this morning cannot be held, and that some of our members cannot remain to be present at an adjournment of said hearing:

We hereby take this method of indorsing the bill for an act which is now before your honorable body and to commend for your consideration H. R. 8152, made by Mr. Tarsney, of Missouri, on behalf of the Committee on Public Buildings and Grounds, of the House of Representatives, and believing that its importance as an economical measure and also as insuring that excellence of professional service which is more marked in private practice than in that of the United States Government, we urge such action on your part as will insure the passage of the Act before the adjournment of the present Session of Congress. We also wish to call your attention to the paper prepared by James H. Windrim, late Supervising Architect, on *Architecture and the United States Government*.

E. H. KENDALL,
R. M. HUNT,
R. W. GIBSON,
New York City.
W. W. CARLIN,
Buffalo, N. Y.
ALFRED STONE,
E. I. NICKERSON,
Providence, R. I.
T. P. CHANDLER,
GEO. C. MASON,
Philadelphia, Pa.
W. G. PRESTON,
Boston, Mass.
JAMES W. MCLAUGHLIN,
GEO. W. RAPP,
Cincinnati, Ohio.
L. T. SCOFIELD,
Cleveland, Ohio.

W. W. CLAY,
Chicago, Ill.
W. S. EAMES,
P. P. FURBER,
C. E. ILLSLEY,
St. Louis, Mo.
GEO. B. FERRY,
Milwaukee, Wis.
W. C. SMITH,
Nashville, Tenn.
W. M. POINDEXTER,
ROBERT STEAD,
GLENN BROWN,
LEON DESSEZ,
J. C. HORNBLOWER,
J. G. HILL,
Washington, D. C.

At the meeting held January 12th, although there was no quorum of the committee present, the case of the architects was presented by Mr. E. H. Kendall and Mr. R. M. Hunt, covering the points made before the House Committee. (See *American Architect*, April 2, 1892, and report by House Committee.)

Supervising Architects Potter, Hill, Bell, and Windrim are on record advising such legislation. In this year's report Mr. Edbrooke, the present incumbent of the Supervising Architect's office, takes the ground that the A. I. A., through its representatives, are in error. He claims government buildings are fully equal to municipal and private work of like magnitude in artistic effect, time of erection, and cost of construction.

On the question of cost he limits himself to the work done during the present administration.

On the first point,— character of design,— we can only judge from the buildings erected and the designs of public buildings contemplated. These fall far short of the best, or even the better, class of private work, as acknowledged by all who are capable of judging.

The time of erection is prolonged to double and treble the time it takes to erect similar structures for private corporation.

A conspicuous comparison may be made between the County building in Pittsburgh, Pa., and the Pittsburgh post-office. The first is one of the architectural monuments of the country, while the second is commonplace in the extreme. The first cost thirty-one cents per cubic foot. A similar post-office to the one in Pittsburgh cost over sixty-five cents per cubic foot.

It is difficult to compare the cost of buildings during the present administration with other work, as none of any of magnitude have been commenced and completed under the present incumbent, who came into office in the spring of 1891. GLENN BROWN.

THE EIGHTH LEAGUE EXHIBITION.

Miserere in Choir of Amiens Cathedral. From *L'Art pour Tous*.

WE know an artist who once took a picture to a dealer to sell. The picture had a fine frame, and appeared to its author quite attractive. He showed it to the dealer, and asked him how much he would give for it. "So many dollars," said the dealer, after a brief survey. "Why," said the disappointed artist, "that is what the frame cost!" "So I supposed," replied the dealer, with unmoved countenance. It would, indeed, be far from our thoughts to apply this tale as an illustration of the value of the architectural drawings shown in the exhibition, but we must confess that it recurred to our minds as we compared the single small roomful of drawings with the noble series of galleries in which it was, this year, almost lost. Whether the actual number of strictly architectural works was smaller this year than last, or whether the difference was due merely to the contrast between the rooms in the Fifth Avenue galleries and those of the Fine-Arts Society's new building, we cannot say, but their effect was certainly much less important. However, as this was more than made up by the beauty and interest of the loan exhibition of tapestries, rugs, metal-work, and bric-à-brac of all sorts, which has never been so well shown before, and covered the walls of the new gallery — named for Mr. George W. Vanderbilt — with a charming dress of form and color.

Leaving this, however, for the present, we will devote ourselves to the more strictly architectural part. It is, perhaps, the misfortune of the present exhibition that it contains no special feature, like the collection of drawings for the Columbian Exhibition, which was shown last year, or the competitive designs for the New York Cathedral, which attracted so much attention the year before. The most noticeable set of drawings, similar in subject and of ambitious execution, consists of those for various State buildings in Jackson Park: North Carolina, Iowa, Georgia, Ohio, Minnesota, Texas, Massachusetts, Connecticut, Maryland, Rhode Island, New Hampshire, California, Pennsylvania, New Jersey, Nebraska, and New York being represented. Among these, the California Building is, perhaps, the most conspicuous, being shown in a very large, showy drawing, effectively, though rather crudely, rendered in color. In the design, the Spanish-Californian Mission style is very cleverly used. There is no style so characteristic of California as this, and, although some variations in scale between the different features of the building might be noted, the effect is not only striking, but quiet and architectural also.

Next to this in interest, and quite equal to it in originality and cleverness, is Messrs. McKim, Mead & White's design for the New York State Building. Nothing more different in conception from the California Building could well be imagined. While that is a long, low, yet dignified mass of whitewashed adobe, the New York house is a small Renaissance palace, brilliant and elegant, as becomes the *pied-à-terre* of the Empire State at Chicago. The drawing in which the design is shown, which is by Mr. F. L. V. Hoppin, is a curiosity in its way. At first view, the sky appears to have been painted with a whitewash brush, and the foliage then laid in with a sponge; but the architecture is not only correctly, but carefully, drawn and colored, and the whole effect is at once delicate and bright. The only remaining State building presenting any striking peculiarity is that of Georgia, by Mr. G. L. Norrman, of Atlanta, which portrays to the life the Greek-temple type of architecture, characteristic of the old Southern court-houses, colleges, and other public buildings. The style was once as familiar in the North as in the South, but the greater material progress of the North has long since displaced the temple court-houses and academies, and they are now confined mostly to the Southern towns, with whose air of cultivated repose they harmonize admirably.

Among the designs of more local interest, that of Mr. Henry B. Herts, for the Columbus memorial arch in New York, is noticeable, partly on its own account, and partly on account of the praise which the *Art Amateur* has bestowed on it. The *Art Amateur* compares it with Mr. White's Washington arch, to the disadvantage of the latter — a judgment in which we do not think that architects generally will coincide. Although well studied and nicely drawn, it does

not seem to us that Mr. Herts's design has the poetry and refinement of Mr. White's, nor do we quite approve of the polychromatic style adopted. In the opinion of the *Art Amateur*, the design is to be commended on account of this feature, and it is conceivable that a composition of the sort might add the attractions of color to those of form; but the attempt to accomplish this result usually ends in practically sacrificing the form to a mediocre color-effect, and, so far as can be judged from a drawing, Mr. Herts's arch would not form a conspicuous exception to the rule.

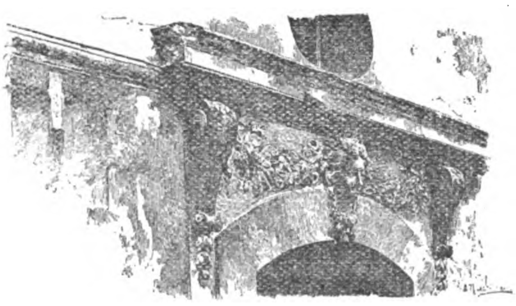
As we look along our marked catalogue for notes of other remarkable works we are reminded of a striking design, by Mr. A. Page Brown, for what the catalogue is pleased to call "El Grau Mercado de Lima." It obligingly adds a parenthesis, explaining that this means "The Grand Market."

The design of the Grand Market, according to our notes, consists in a happy combination of the Madison Square Garden tower and the St. Augustine hotels, associated with, or, rather, surrounded by, an arcade, of a rather Flemish pattern. The combination is by no means a bad one, and the building must be very imposing in execution, if it has been executed, as to which we have no information. Of the remaining architectural drawings, while all are good, and some very good, our notes do not indicate any of such extraordinary interest as to make it necessary to extend this article unduly to include them.

The "allied arts" rooms contain, however, some curious objects. Among others should be mentioned, for the benefit of those who have to design silverware, the competitive drawings for the silver service to be presented to the cruiser "*New York*" by patriotic citizens of the metropolis. The designs are not particularly good, and some of them are decidedly bad, but one set of drawings attracts attention by the remarkable beauty of its rendering, which makes every other set in the room look thin and scratchy. On examination, this rendering, which gives the very color and smooth sheen of silver, is found to be produced by cutting the body of the object out of a rather warmish gray paper, and pasting it on white card, and then tinting the shadows with what seems to be Payne's gray, not applied in the usual way, but, apparently, showered on with an old toothbrush, after the fashion of the "spatter-work" which used to delight the infant mind some years ago. This spattered tint gives an extraordinary roundness and smoothness, which is heightened by putting in a cloudy cast shadow on the white card, in the same way and with the same tint; and nothing remains but to brighten up the drawing with a little brush-work, partly in Payne's gray, and partly in Chinese white.

The temptations of the bric-à-brac room do not permit us to linger long over the less strictly professional drawings, but the very extent and variety of the bric-à-brac collection makes it impossible to give any idea of it in the small space which can be devoted to the subject; so that we shall do best to say nothing about it, and conclude with a mild criticism — not new, but still necessary — of the proof-reading of the catalogue. The names of the exhibitors do not suffer as severely as they have on previous occasions, and this is something to be thankful for; but the proof-reader seems to have revenged himself on the saints and foreigners for the extra trouble that he has been put to in making the names of mortal compatriots recognizable. Thus, we find Santa Prassede masquerading as "St. Prosseole"; Raphael appears as "Raphæl"; and Viollet-le-Duc as "Viollet-le-Due"; Dinan becomes "Dinau"; the Hôtel d'Ecoville is printed "Ecouille," and Haddon Hall is called "Hadden." On the whole, however, the catalogue has improved in this respect, and, with a little more care on the part of the committee-man, to whom the thankless and repulsive task of proof-reading is assigned, the last blemish on what is otherwise a very perfect piece of bookmaking would be removed.

DRAINING THE OKEFINOKEE SWAMP.



Window-head, Eighteenth Century, French. From *L'Art pour Tous*.

THE work of draining Okefinokee swamp, the biggest undertaking of its character in America, which will eventually reclaim 220,000 acres of the finest agricultural land in the country, is progressing at a remarkably satisfactory rate. One of the engineers in charge of the work was in the city yesterday, and gave the writer an interesting chat about the scheme, which will open up a section which for centuries has been under water and muck, the home of alligators and various other reptiles.

One hundred and fifty laborers are now at work at the swamp, and the construction of the great canal, which is to carry the water from the swamp to St. Mary's River, is being pushed forward as rapidly as machinery and human hands can accomplish it. After January 1 this force will be doubled, one-half working during the day and the other at night, so that this year's results will be twice as much as that of the last twelve months.

This canal, when completed, will be 150 feet wide and 63 feet deep, with a fall of 125 feet to St. Mary's River. The most difficult part of the construction will be through a high knoll two miles long. Through the middle of the swamp, another canal, sixteen miles long, will be constructed, with small branches, the whole to act as feeders to the big drainage stream.

When the latter is completed, two hydraulic pumps, with a capacity of 30,000 gallons each per minute, will force the water off the swamps, while the largest inland dredger in the world will remove the muck and tear away the stumps, leaving behind a beautiful clay subsoil, which has become wonderfully rich by the muck accumulations of centuries. This muck averages six feet deep. The dredge is a ponderous machine 90 feet long, with a 40-foot beam. It is what is known as a combination dipper and stump-puller.

By April 1 the company will be able to secure timber from Okefinokee. In this alone the wealth of the swamp is incalculable. Its pine growth is the most magnificent in the world in point of size and quality, and its cypress deposits cannot be equalled anywhere. The pines average seventy feet to the limb, are as straight as an arrow, and from one to eight feet in diameter, while the cypress trees are enormous in size, the average diameter being from ten to twelve feet. Saw-mill men have besieged the company to secure the timber, but, as it is of such valuable quality, the company will probably erect saw-mills on the edge of the swamp and develop the timber on its own account.

The engineers expect to find many valuable curios as the work progresses. Already they have found evidences of Indian habitation of the numerous small islands which dot the great swamp. Numbers of Indian mounds have been discovered on these islands filled with all styles of pottery, specimens of which have been sent to the Smithsonian Institution at Washington.

The most interesting curiosities, however, are expected when the big dredge begins its work of removing the muck from the swamp. The engineers believe that mammoth wild animals, now extinct, made their homes in the swamp in past centuries, and are anxiously looking forward to the turning up of carcasses to prove their theories.

Just what length of time will be required to complete the draining of Okefinokee the engineers are unable to estimate, but it is safe to say that there is work ahead for several years. When the reclamation is accomplished, the stockholders of the company who had the nerve to put their money into the scheme, which, when first broached, appeared to many as a wild vagary, will realize handsomely on their investments. It may take a long time, but it is one of those things worth waiting for. — *Savannah News*.

SOCIETIES

THE ARCHITECTURAL LEAGUE OF NEW YORK.

THE regular monthly dinner of the Architectural League of New York was held in the club-room, 215 West 57th Street, on Wednesday evening, January 11, there being present forty-seven members and seven guests. Vice-president William A. Coffin presided, and introduced the subject for discussion, "The Policy and Prospects of the League in the Future," with a forcible speech. A most interesting discussion followed, participated in by Messrs. Price, Hamlin, Clark, Huss, Du Fais, Wright, Israels, Berg and Briggs. The financial condition of the League was shown to be sound and the policy suggested by the various speakers was to be progressive and aggressive in the interest of architecture and the allied fine arts.

The subject of the proposed new City Hall, for the city of New York, was brought up and thoroughly discussed. A committee of five, Messrs. Bruce Price, Charles I. Berg, R. M. Hunt, John Du Fais, George L. Heins, and the President, Russell Sturgis, was appointed by the Chair to confer with the city officials and find out their intentions in regard to the proposed new structure.

WARREN R. BRIGGS,
Treasurer and Acting Secretary.

THE WORCESTER CHAPTER OF THE AMERICAN INSTITUTE OF ARCHITECTS.

THE Worcester Chapter of the American Institute of Architects was held at the Worcester Club, on Elm Street. President Elbridge Boyden presided. Architect A. P. Cutting read a paper giving a personal account of the late convention of the American Institute at Chicago, held in connection with the dedicatory exercises of the Columbian Exhibition.

ILLUSTRATIONS

[*Contributors are requested to send with their drawings full and adequate descriptions of the buildings, including a statement of cost.*]

HOUSE OF S. ALEXANDER ORR, ESQ., TROY, N. Y. MR. H. LANGFORD WARREN, ARCHITECT, BOSTON, MASS.

A VIEW of the entrance to this building was published in heliochrome in the *American Architect* for July 26, 1890.

[Gelatine Print issued with the International and Imperial Editions only.]

OLD COLONIAL WORK, SALEM, MASS. MEASURED AND DRAWN BY MR. CLAUDE F. BRAGDON, ARCHITECT, ROCHESTER, N. Y.: THREE PAGES.

[Issued with the International and Imperial Editions only.]

SKETCHES BY THE *American Architect* TRAVELLING-SCHOLAR FOR 1891, MR. ALBERT KAHN, DETROIT, MICH.: THREE PAGES.

[Issued with the International and Imperial Editions only.]

STATE ASYLUM FOR THE CHRONIC INSANE, WERNERSVILLE, PA. MESSRS. RANKIN & KELLOGG, ARCHITECTS, PHILADELPHIA, PA.

HOUSE OF CHARLES BENNER, ESQ., SETAUKET, N. Y. MESSRS. LAMB & RICH, ARCHITECTS, NEW YORK, N. Y.

PROPOSED HOUSE FOR WM. F. FORSYTH, ESQ., WINCHESTER, MASS. MESSRS. WAIT & CUTTER, ARCHITECTS, BOSTON, MASS.

SKETCH FOR PROPOSED PRESBYTERIAN CHURCH. MR. W. J. EAST, ARCHITECT, PITTSBURGH, PA.

PUBLIC SCHOOL BUILDING, SAVANNAH, GA. MR. G. L. NORRMAN, ARCHITECT, ATLANTA, GA.

[**Additional Illustrations in the International Edition.**]

CENTRAL SOUTHERN PORCH OF THE MANUFACTURES AND LIBERAL ARTS BUILDING, WORLD'S COLUMBIAN EXHIBITION, CHICAGO, ILL. MR. GEORGE B. POST, ARCHITECT, NEW YORK, N. Y.

[Gelatine Print.]

PRIVATE HOUSE, PARIS, FRANCE. M. G. DEZERMAUX, ARCHITECT.

[Copper-plate Photogravure.]

REAR ELEVATION AND PLAN OF THE SAME.

[Copper-plate Photogravure.]

FOX OAK, BURHILL, NEAR WEYBRIDGE, ENG. MR. HALSEY RICARDO, ARCHITECT.

MANCHESTER TECHNICAL SCHOOLS, ENG. MR. ERNEST RÜNTZ AND MR. F. R. FARROW, ARCHITECTS.

THESE designs were submitted in competition and were awarded the third premium by Mr. Alfred Waterhouse, the assessor. The stipulated cost was £75,000, and the building had to provide accommodation for thirteen departments. The main idea was the arrangement of all the lecture-rooms on the first floor, so that students and professors attending lectures only should not have to traverse any of the other departments to get to their lecture-rooms. The staircase at Granby Row entrance serves the first floor. The two central staircases, which are carried up the whole height of the building, serve the various departments direct, and also the lecture-rooms, for students taking laboratory instruction. Separate entrances are arranged, as shown, for the Commercial Department and Women's Work Department. Throughout the whole of the scheme great care was taken to arrange each department so that it should communicate directly with the central staircases, thus obviating the necessity of students entering any other corridor except that connected with their class rooms. The materials proposed were Ruabon bricks for facings, with buff terra-cotta for dressings.

PLANS AND SECTION OF THE SAME.

FRANCOIS COPPEE ON THE EIFFEL TOWER: —

A ces hauteurs vertigineuses
Le savant voit-il mieux les chocs
Des mondes et des nebuleuses?
Non pas; on y prendra des bocks.

COMMUNICATIONS

[*The editors cannot pay attention to demands of correspondents who forget to give their names and addresses as guaranty of good faith; nor do they hold themselves responsible for opinions expressed by their correspondents.*]

THE VALIDITY OF GENERAL CONDITIONS.

INDIANAPOLIS, IND., December 30, 1892.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs, — I have been informed that in a previous issue of your paper there was an account given of a lawsuit in which the courts held that the "General Condition" clause of specifications was valid and binding. By giving date of such issue you will greatly oblige F. W. CADY.

[GENERAL Conditions, attached to specifications, and forming evidently a part of them, are just as valid as any other portion, and, as the specification is usually made a part of the contract, the general conditions are also incorporated in the contract. In the papers on "Architect, Owner, and Builder before the Law," which have been appearing in these pages, and are now nearly ready for publication in book form, may be found a great number of instances in which the various stipulations usually included under "General Conditions" have been enforced by the courts. — EDS. AMERICAN ARCHITECT.]

THE DESTRUCTION OF "THE BREAKERS."

EXCHANGE BUILDING, STATE ST., January 8, 1893.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs, — Did you have any knowledge on which to base so definite a theory of the cause of the fire at Mr. Vanderbilt's as that expressed in the enclosed clipping and which gained us an advertisement at the head of your editorial column? If so, it would greatly interest us to hear what it is, and if not, were you not making rather free with the facts and our name?

Yours very truly, PEABODY & STEARNS.

[IN answering this communication, it is a temptation to reply in kind, but, shutting our eyes to the manner, we will answer the matter by saying that the most circumstantial account that we have seen of the burning of Mr. Vanderbilt's house said that fire was found to exist behind the plastering surrounding one of the chimneys in the second story, if we recollect rightly. There were other things in the account which confirmed the inference, already obvious, that such a condition of affairs must probably have been the result of the escape of sparks through the masonry among the furrings. If Messrs. Peabody & Stearns have any different account of the facts to give, or can deduce any different inference from them, we shall be glad to publish their account of the disaster. We do not comprehend how we have made "rather free" with their names, since they assuredly were the architects of the Lorillard-Vanderbilt house. — EDS. AMERICAN ARCHITECT.]

WINDOWS OVER THE FIREPLACE.

NEW YORK, January 16, 1893.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs, — Mr. John Brett, in his paper on "Daylight in the Dwelling-House," deplores the tendency of architects to break up wall-surfaces by putting in doors, windows, and fireplaces. He would be interested in knowing that some architects at least agree with him, for in several houses we find wall-space saved by putting windows over the fireplace. And in a picturesque residence in Montclair, N. J., the window is in the back of the fireplace.

But, aside from saving space, can one imagine anything more atrocious? With the bull's-eyes shining through the back of the fireplace, we are reminded of a customer who wished to place a lamp in his fireplace, — that it might look like a burning grate. Architects who permit these things have no right to remain in the professional circle. EDWIN A. JACKSON & BRO.

NOTES AND CLIPPINGS

COOLING RAILWAY-CARRIAGES IN TROPICAL COUNTRIES. — An ingenious contrivance for cooling railway-carriages was shown us the other day. It consists of small tanks at both ends of the carriage, which receive their supply from the main tank above, which holds water for the passengers' use. From these tanks are conveyed dropping troughs, which work automatically, canting over gently when full of water, and perfectly saturating kus-kus tatties that are suspended across an open trap-door, which is let down at the fore end of the carriage in whichever direction the train is travelling. This keeps up a constant supply of cool air, without any necessity for passengers twisting and turning the little nonsensical arrangement they now use on some railways. Added to the cooler is the centre revolving punkah, which is a round light rod fitted with four stiff fans, but not so stiff as to hurt if one's head happens to come in contact. When the train moves the punkah goes round and round, and its revolutions can be moderated by loosening or tightening the check-chain. Altogether the invention is a good one, and will simply be perfect when the inventor accomplishes what he hopes soon to do, viz., to convey the surplus

cool air during movement into a cylinder, and so compress it as to admit of its gentle release when the carriage stops, and thus keep down the temperature when the train is at a standstill. — *Indian Engineering.*

Malevolent Statues. — When Darius I, according to Herodotus, wished to erect his statue near that of Rameses II (Sesostris), the priests objected on the ground that Sesostris was a greater conqueror than he. The statue in question was one of several erected before the Temple of Ptah at Memphis, on the borders of the sacred lake, where is now the village of Bedreshein. After Memphis became Christian the renown of its monuments died away, and when it perished the stones were removed to serve in building Cairo. One colossus remained to our day, it having been preserved under the sand, and on being unearthed by Caviglia at the beginning of the century was found to represent Sesostris in his youth. This colossus has been visited by most tourists in Egypt. It lay on the sands near the palm of Bedreshein, in a hollow or ditch, and was covered with water during the inundation. The remains of the temple might be traced along the lake, which is still represented by a depression in the ground, covered with wheat-fields. Of late years General Stephenson and Major Bagnold, R. E., have excluded the waters from the colossus, raised it on timber supports above the ground, and surrounded it by a brick wall. On payment of two piastres, however, it can be seen by the curious. M. Maspero, the great Egyptologist, relates in a French contemporary that the Arabs had formerly a great awe of this, which they called Abou'l Hol, the "father of fright," as they do the Sphinx. The ancient Egyptians, he assured us, believed that statues, divine or human, were animated by a spirit or "double" detached from the soul of the person they represented. This double ate, drank, and spoke or delivered oracles. In later times the double was credited with playing evil tricks on those who approached the statue, and even with killing them. His power could be destroyed by breaking the statue, or at least the features; hence it is that so many statues of the Pharoahs have been mutilated by the Arabs. The spirit of Rameses II was supposed to haunt the palms at night, and M. Maspero relates that every time he passed by in the evening towards dusk the driver of his ass would mutter his prayers and hurry on his beast. One evening M. Maspero asked him if he was afraid of some "afrite," and the driver begged him not to speak of such things or some harm would befall him. Presently M. Maspero was thrown from the ass in the middle of the wood, and the incident was regarded by the driver as a punishment for his not speaking respectfully of the spirit in the statue. Egypt is full of such superstitions dating from the far past. — *The London Globe.*

The Garbage Destructor at Oldham. — A furnace for the destruction of the town's refuse is in operation at Oldham, England, which burns at a temperature of over two thousand degrees, F, and this prodigious heat, when applied to raising steam, is said to render sufficient power available to more than repay the cost of collection and burning. The cells of the destructor are each just over five feet wide, and one of the most important features is a jet of steam which forces air into the closed ash-pit by means of surface friction at a pressure equal to one-half inch of water. Another special feature is the arrangement of flues and flue openings, these being placed in the front of the reverberatory furnace arch, over the hottest part of the fire; thus the gases given off by the drying refuse at the back have to pass over the hottest part of the fire, of two thousand degrees temperature, and through small apertures in a red-hot reverberatory arch, before they can escape; the flues pass along over the top of the reverberatory arch and then down through cavities in the side walls to the main flue underneath. The furnace is practically surrounded with hot gases, which have the maximum effect in drying the green refuse. A longitudinal trough or hopper is at the back, into which the carts tip direct, the hopper being brought down to the grate-bars, and the opening at the back is of the full width and height of the furnace; the grate-surface proper is twenty-eight square feet in each cell. The refuse is gradually moved forward by a wave-like motion, and deposited in the form of clinker on the wide "dead plate," where it remains until the attendant comes along to remove it. The continual admission of cold air to the furnace is by this arrangement completely avoided. — *N. Y. Sun.*

The Temperature of Melting Steel. — Recent investigations made by means of the pyrometer show that the temperatures which occur in melting steel, and in other industrial operations, have been over-estimated. It is now demonstrated that both the amount of light emitted from a body and the quantity of fuel required to heat it increase much more rapidly than the temperature. The calorimetric method has been that most frequently adopted for determining high temperatures, the assumption being made in this case that the specific heat of the iron rods or balls used is constant, which assumption, however, is inaccurate. In the case of the flame of the Bessemer converter, the temperature of the issuing flame has been recorded as two thousand degrees, Cent., because platinum appears to melt rapidly in it. This, again, fails to coincide with the outcome of recent experiments, the fact being, as now represented, that platinum does not really fuse in the flame, but only appears to do so, on account of its alloying itself with drops of molten steel carried over by the blast. — *N. Y. Sun.*

Chicago's Proposed Elephant Restaurant. — Chicago is to have a gigantic elephant, larger than the one at Coney Island, which is only one hundred feet high. A syndicate, backed by Frank Hall, who, with J. Mason Kelley, the Brooklyn architect, constructed the Coney Island affair, will begin work on the new animal building, to be located near the Fair grounds, in a short time. This steel mammoth will be 125 feet high to the ridge of the back and 200 feet to the top of the "howdah." The trunk will be swung by machinery, the ears will flap, the eyes will roll, and the tail will wag. Within this trunk will be a calliope to simulate the beast's roar. There will be two floors in this $250,000 elephant — the main floor and grand promenade and dancing-hall, with a gallery, and the "stomach floor," where will be located a great restaurant. The animal will be lighted by numerous windows and an abundance of electric lights. The projectors are certain that it can be constructed in three months. — *Cincinnati Commercial Gazette.*

An Old Wall-painting Found. — The parish church of Wenhaston, in Suffolk, England, has lately yielded an old wall-painting. It has suffered at various times from two sorts of inconoclasts — one sort the destructive purists, who were so called; the other sort the no less destructive parish priests. A rood beam remains, over which, until lately, stretched to the roof a wooden partition covered with plaster. The partition was removed and placed in the churchyard, where rain washed away the plaster and showed traces of a painting. On treating the plaster carefully, a complete "Last Judgment" came to light, with three rows of Gothic inscription below it. A cross of wood nailed on the face of the painted partition formed part of the scheme. The ground color was olive-green. The date fixed is prior to A. D. 1520. The large feet and slender limbs of the naked souls in paradise or near the jaws of the hell monster recall early Italian work; and perhaps the painting itself was performed by some Italian or Fleming, for the British clergy of that period were not by way of encouraging native artists. — *N. Y. Times.*

Curious Accident to an Intake Pipe. — The water-works intake pipe at Toronto rose from the bed of the bay a few days ago and broke through the ice at several points, parting or opening at some of the joints. It is said that the flow of water through the pipe was so obstructed as to cause it to become empty, after which it floated to the surface. — *Engineering News.*

TRADE SURVEYS

An enormous volume of business for this season of the year has been developed within the past few days, despite the difficulties in traffic. Advices from a large number of commercial and manufacturing centres in the New England and Middle States show that numerous orders — some of them for very large quantities of material — have just been received, and that inquiries for late delivery are flowing in even faster than was anticipated in December. Advices not quite so encouraging are received from farther West; at Chicago, Milwaukee, St. Louis, and one or two more remote points there are indications that a very large amount of business will soon be transacted in general merchandise, and the opinion is held by competent authorities on this point that the small store-keepers throughout the country are lower in stocks than usual at this time, and that there is a strong confidence in the permanency of prices, which will lead them to order liberally for three or four months' supplies. In the mining regions of the West, while everything is tied up so far as actual operations go, there is a strong feeling of confidence as to the year's business. A great deal of improvement and expansion of work is in contemplation, and operations will begin just as soon as possible. It transpires that a great many new mines are to be opened, but whether more work than the mere opening will be done is not apparent as yet. It is also known that a great deal of money has been subscribed in Eastern centres for investment in mining properties in the West, chiefly iron ore, copper, and lead. There are evidences that this will be a very active year in the mining States, and that this improvement will be due to the heavy investments made by Eastern capitalists, who think they see a long way into the future. Railroad managers also say that while construction at this time is hampered, and while plans are not perfected for the coming year, without doubt, a great deal more work will be done than last year, some of them fixing the increase in consumption of steel rails at one-third. The probabilities, however, are that the increase will reach one-half. The strongest and most encouraging feature in the commercial situation is the moderate amount of stocks on hand, and the probability of a heavy demand soon setting in to replenish. The manufacturers of almost all kinds of dry goods are particularly encouraged just now; the same may be said of the boot and shoe manufacturers. Stronger, though perhaps not higher, prices are confidently looked for within the coming six months. The more sanguine, of course, anticipate an advance, but, as has been frequently stated, the extraordinary producing-capacity in every industry is against this probability. The iron trade is gaining very slowly. The lumber manufacturers are full of hope but short of business. The cotton-growers anticipate a very good year, and believe that a reaction is about to set in, which will bring prices to a higher level. The anthracite-coal trade is very active, and prices have slightly advanced. A very heavy demand has lately set in, but this is due to merely temporary causes. After all the predictions that have been made as to the probability of a stringency in money, it is rather surprising that there is such an abundance and ease in banking circles. Nearly all demands are promptly met, and the banking interests say there is an abundance for all commercial requirements. Another fact deserving of at least passing notice is the possibility of a growth, within the next few months, of demand for American securities. Certain causes are at work in Great Britain and Europe pointing to this result, among them a growth of confidence among the better informed of the Old-World investors, and the fact that they find the opportunities for making investments at home decreasing, rather than expanding. An increasing amount of money is likely to seek investment on this side, and securities, when once purchased, will probably be held with more evenness than heretofore. For some time, at each shock to confidence, a return flow has set in, upsetting all calculations, and unsettling plans and possibilities for sound and safe financial management. The incoming of an administration hostile to prevailing economic conditions is having little weight with business men; they seem confident that necessity will forbid any very radical departure from present policies. It is also becoming apparent that but little progress will be made in the solution of the silver question. The hopeless differences between public men in both parties on this question render any immediate settlement improbable.

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CONTENTS

SUMMARY: —
The Recent Fires in Boston a Stimulant to the Insurance Companies. — Circulars, Catalogues and Advertisements. — The New York City-hall, Present and to Come. 49
THE ILE-DE-FRANCE SCHOOL OF ARCHITECTURE. — II. 51
ARCHITECTURAL SHADES AND SHADOWS. — XVII. 54
LETTER FROM CANADA. 57
A FRENCHMAN ON THE WORLD'S FAIR AND AMERICA. 58
A CENTURY OF FRENCH ART AND EDUCATION. 61
SOCIETIES. 61
ILLUSTRATIONS: —
House of Dr Henry Hooper, North State St., Chicago, Ill. — Architectural Shades and Shadows: Plate IX. — Central Building, Kindergarten for the Blind, Jamaica Plain, Mass. — Public Library, Charlestown, N. H. — House at New Cumberland, W. Va. — House designed by Mr. Samuel Milligan, Architect, Philadelphia, Pa.
Additional: The Ancient Cathedral of Cambrai (Nord), France. — Dome of the Cathedral, Marseilles, France. — Staircase, Schloss Mirabell, Salzburg. — St. Paul's Cathedral, Calcutta, India. — All Saints' Church, Hertford, Eng. — New Premises, Chelsea, Eng. — The Church of the Rosary, Lourdes, France. — St. Paul's Cathedral: South Side of Choir Stalls. — Details from the Same. — A Flemish Maison Communale. — Offices, Lawrence Lane, London, E. C., Eng. — Sandhill School, Launceston, Tasmania. — Design for Villas, Mount Martha Estate. 61
NOTES AND CLIPPINGS. 64
TRADE SURVEYS. 64

MR. EDWARD ATKINSON writes to the Boston *Herald* an interesting letter in regard to the recent Federal Street fire in that city. The fire started in a large wool warehouse, and, although it was bravely fought by the firemen, it caused a destruction of about sixteen hundred thousand dollars' worth of property. As the *Herald* remarks, this is fully two-thirds of the total annual premium paid for fire-insurance by the property-owners of Boston, so that, considering the expense of carrying on the business, the underwriters have already lost all that they can afford to lose for the whole year; and, even if there should be no more fires, their Boston business at the end of 1893 will show no profit. This is, naturally, a rather unpleasant state of affairs for the insurance companies, and Mr. Atkinson, who is in a position to know about the matter, says that business is already suffering, on account of the unwillingness of underwriters to issue policies on many buildings in the business part of the city, and that another great conflagration, such as, in his opinion, is sure to occur, will induce the principal foreign companies to withdraw altogether, and will put half the native companies into bankruptcy, causing, of course, a long period of stagnation and depression. As is his way, he attributes the defenceless condition of the business portion of the town to "neglect of duty" on the part of the owners of buildings, and, to a certain extent, he is right; but, as we have so often maintained, and as even insurance-men, who used to have no epithets too virulent to apply to the architects of buildings which happened to be burned, are beginning to acknowledge, it is the insurance companies, and the insurance companies alone, which can dictate the sort of construction to be used in an entire community. So long as underwriters will insure a combustible fire-trap at nearly the same rates as a solid, conscientiously constructed building, just so long the fire-trap will be the ordinary construction, and the solid building the exception. Here and there an owner is found who, against his own interest, will try to build in such a way as not to endanger his neighbors, and architects are always the first and foremost in endeavors to secure legislation to enforce better methods of building, which the underwriters might cause to be adopted at a week's notice, if they chose, by a change in premium rates, but by which they prefer to profit quietly. Now, in the architect's view, Nemesis appears to be overtaking the insurance companies, and the practice of charging exorbitant rates on good risks, to allow policies to be placed at competitive rates on bad ones, has, naturally, diminished the number of good risks, and increased that of bad ones, until the companies appear to be on the verge of being devoured by the lath-and-furring Frankensteins, the creation of which they have, at least, encouraged. As our readers know, the complaint that the influence of the insurance companies has tended to promote bad and combustible construction is made abroad, as well as here, and it seems to be well founded. Now, however, according to Mr. Atkinson, the underwriters, in Boston, at least, seem to have been forced, for self-preservation, to take some action. We trust that they do not contemplate any such action as he suggests, that is, withdrawing from the city, or going into bankruptcy, if there should be another great fire. Of these two courses, the first would be foolish, and the second dishonest, and there is certainly something better to be done than either. To the ordinary mind, the obvious and straightforward course seems to be to charge premiums proportionate to the risk. It is not difficult to make the necessary calculations for the purpose, and, although the rates on the average Boston wool and leather warehouses, thus figured, would probably be rather startling, the effect would be to send the wool and leather merchants immediately in search of non-combustible buildings, and to set land-owners at work building such structures to meet the demand, which is exactly the result which is to be desired, and which must be secured before Boston or any of our large cities can become safer against destructive conflagrations. Mr. Atkinson, in his *Herald* letter, urges the adoption of his excellent plan of roof-hydrants, and this would, of course, be very desirable; but it is a mere detail. To meet what, we are sure, will be the demands of the near future, not merely roof pipes, but iron, brick, concrete, and terra-cotta must be the familiar features of construction for mercantile purposes. There are no architects in the world who use these materials with more skill than those of New York, Chicago and Boston, and they await only the impulse, which no one but the insurance companies can give, to provide just the degree of security against fire which the underwriters make it for the interest of owners to call for.

THE season of circulars will soon be at its height, and every busy architect has already to spend an appreciable part of each day in opening and tossing into the waste-basket a pile of documents which might have some interest for a man of leisure, but which he himself cannot spare time to read, much less to file away where he could find them again if he should ever have occasion to refer to them. It is curious to observe the simplicity with which the people who send circulars assume that no one but themselves has thought of that way of advertising. Most architects receive probably at least one huge placard every week, accompanied with a more or less peremptory request to them to "hang it in a conspicuous position in their office." As a good deal of money is often spent in the production of these objects, those who send them may be interested to know that, being easily recognizable, either by being packed in a large mailing tube, or by their brass edging, or the pink tape attached to them, or some other familiar sign, they form particularly available aliment for the waste-basket, to which they are usually consigned without opening.

IT is strange that the people who send out such things do not realize that if they were hung up in the offices, as intended, the walls of the largest office would be covered in a few months, to the exclusion of the photographs and framed drawings, of which every architect has already more than he can find room for. So with circulars. Although many come which an architect would be glad to file for future reference, it is impossible, out of the thousands which arrive every year, to preserve more than a very few, for the reason that, if a larger selection is made, the labor of turning them over to find the one wanted soon becomes so great that no use is made of them. With catalogues in book form, such as those which the great lock-companies and dealers in plumbing materials send out, the case is somewhat different. They can be put in a bookcase and found at a glance by the title on the back, and, in consequence, they are frequently consulted by architects, no doubt to the advantage of those who publish them. It is true, of course, that most manufacturers of building materials and appliances do not sell a sufficient variety of goods to make it possible for them to publish a catalogue in the form of a large bound book, but it seems as if something might be done — not only in their interest, but in that of the architects, who would be glad to have the means of finding just what they wanted at

a moment's notice, but to whom a search through several thousand circulars for a particular one is out of the question—to collect descriptions of goods of certain classes, made by different manufacturers, into books of convenient size for reference. We are afraid that we shall have to get a few years nearer the millennium before the rival manufacturers of a given class of goods will unite in placing the description of their products before the profession; yet we are sure that such a proceeding would be as much for their interest as it would be for the convenience of architects. Taking, for example, heating apparatus: in every office, during the winter and spring months, showers of circulars from the manufacturers of furnaces, boilers and radiators are consigned to the waste-basket without opening,—not because they might not be interesting, but because there are so many of them that it is useless to preserve any. The consequence is that the manufacturers of deserving novelties find their wares unnoticed, while architects generally confine themselves to a small range of furnaces and boilers with which they have become familiar. Neither side, probably, is quite satisfied with this arrangement, and it would be for the advantage of both if a substantial book could be put in the hands of architects, containing truthful representations and descriptions of all the principal furnaces, steam and hot-water boilers and radiators in the market, from which they could choose, for further investigation, if need be, the sort that appeared to them most likely to meet the conditions of particular cases. The same thing might be done with moulded bricks, tiles and similar goods, and with a great variety of other products, which could be classified without much difficulty. For goods of a more or less artistic character, half-tone process-plates, such as are sent out in great quantities by the German manufacturers, would give architects the information they would need as to style of design; and as the best designs would probably attract the most orders, a wholesome rivalry in that regard would be promoted among manufacturers.

NEXT to advertising encyclopædias of this sort, which, we must confess, we think are rather things of the future, there is no question that well-written, concise, and well-arranged advertisements in the professional journals are most desirable, both for architects and dealers. We have no wish to call attention to our own merits, and still less to make any false representations in regard to them; but it must be obvious that the more nearly the advertising pages of a professional journal resemble an abridged encyclopædia of the sort we describe, the more useful the journal is to its professional readers, as well as its advertisers. To be all that both could wish, it should furnish, in a position where it could be readily found by an index, a brief advertisement of every material, appliance and process currently used, or adapted to be used, in building, with the address to which application should be made for further information. The advertisements should be classified, so that the whole field should be spread before the inquiring reader, and everything in the market should be advertised, so that the architect could refer to his paper of the current week, with confidence that he would find somewhere in it just what he wanted. To give a single example of the advantages of such an arrangement: we had occasion a few days ago to write specifications for two buildings, both of which were to be heated by hot water, and both of which needed a large supply of hot water for baths and basins. The question was, how to get the hot-water supply for the baths. Although there were one or more small kitchens in each building, the supply which the water-front of a small range could furnish would be totally inadequate to the demand; while the ordinary resource in steam-heated buildings—a reservoir heated by a coil of brass steam-pipe—was hardly available with a hot-water heating system. We remembered having fitted up a physician's office, much to the doctor's satisfaction, with an apparatus for heating water, as it passed through the pipes, by means of a gas-flame, and it occurred to us that a similar apparatus, on a much larger scale, might answer very well the present purpose. The next thing was to find out where to procure one. The circular which described the previous one had long since disappeared, and there was nothing in the shape of an advertisement that we could find in regard to it. We wrote to New York, where an investigation was kindly made for us, which resulted in discovering and forwarding a circular from a manufacturer of such goods in England; and it was not until after much further inquiry, and considerable trouble, that we discovered the address of a manufacturer of just the apparatus we wanted, and completed our specifications by an item calling for nearly a thousand dollars' worth of his goods. Now, as hot-water heating is increasing very rapidly in popularity, not only for private houses, but for office-buildings, apartment-houses, and hotels, and as electric elevators are also coming into extensive use for such buildings, there are already many cases, and there will soon be many more, where establishments of this kind have no occasion to use steam, and, in consequence, are deprived of the ordinary resource for heating water for baths. A hot-water coil in a reservoir could be used, but there is a great difference in heating-power between water at 180° and steam at 250°, and water circulates feebly in such coils as are usually put in for steam; so that capacious and economical gas-heaters would be likely to find a good and rapidly increasing demand, if architects could be kept informed, not by sending circulars, to be thrown unopened into the waste-basket, but by a standing and indexed advertisement, of the place where they, or further information about them, are to be had. The same is true about a great many other things. We have very frequent inquiries from people who wish to buy some material or appliance of which they have heard, but who cannot find out where or how it is to be had. In most cases, we cannot help them, and the manufacturers of the appliance or material lose in consequence not only a profitable sale but the opportunity of extending the knowledge of their goods. We imagine that a dry-goods merchant who kept the shutters up at his windows, and who contented himself with dumping descriptions of his stock into the sewers, would not build up a very thriving trade; yet this is just the policy pursued by many manufacturers, who depend almost entirely on architects for the sale of their goods, yet who oblige their would-be customers to make long inquiries and investigations to find them. In practice, the advertisements in the professional journals are the windows through which architects see the goods which they are expected to buy. It may be a long time before any individual architect has occasion to use some particular object displayed there, but, if it is there, he knows where to get it when he wants it, while, if it is not there, he generally goes without it altogether.

THE Commissioners of the Sinking Fund of New York, together with the other members of the Municipal Building Commission, have rescinded their resolution of last February, under which a site for a new City Hall was selected outside of the City Hall Park, and have determined to place the new structure in the City Hall Park, south of the Court-house, on the same ground as that occupied by the present City Hall, covering, of course, however, a much larger area. Undoubtedly, this is the best site that could be chosen, and it would probably have been occupied by the building long ago had it not been for the persistent pestering of the City Government by the State Legislature, which first authorized the construction of the building in the Park, then amended its action by ordering that it should be placed in the northeast corner; then changed its mind, and directed that it should be located "convenient to, but not in, the City Hall Park," and has now changed its mind again, and given leave to place it in the only part of the Park which is suitable for it, the large open space between the Court-house and the Post-office. There is, naturally, a strong public sentiment in favor of preserving the old City Hall, which is a well-studied, and, in its way, beautiful building, and the city authorities will probably endeavor to satisfy this sentiment. There seems to be no insuperable difficulty in making the old building form a part of the new design. If, however, this solution of the problem is adopted, it is much to be hoped that architects will be allowed to use their own judgment as to the method of accomplishing the desired result. In nearly all cases of the sort, public authorities, with the best possible intentions, handicap the architects by limiting them at the outset to a certain arrangement. Of course, this official disposition may be a good one, but it is not likely to be the only good one, or even the best; and to prevent the persons best able to propose suitable arrangements from doing so, by confining them to a fixed official plan, is to deprive the city of the assistance, in the study of its most difficult problems, of those best able to solve them with success. In great competitions abroad, architects are always allowed very great liberty in the general disposition, as well as in the details of their plans; and it often happens that some extremely novel arrangement, which would never have occurred to the official mind, proves by far the best.

THE ILE-DE-FRANCE SCHOOL OF ARCHITECTURE.[1] — II.

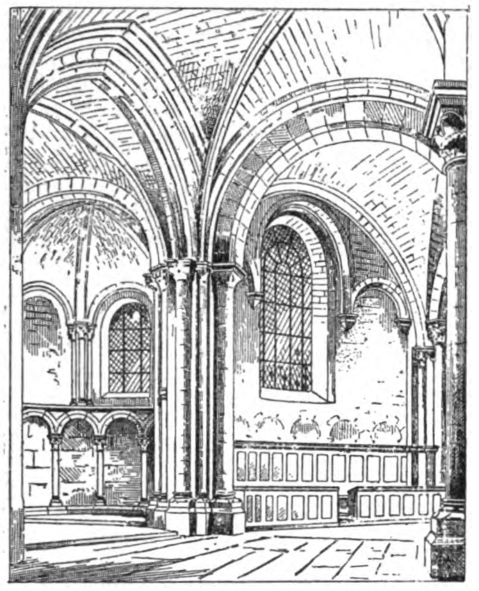

Fig. 7. Deambulatory of Saint-Louis, Poissy.

NOTWITHSTANDING the great progress made in recent years in the knowledge of the sources of Gothic art, divergences of opinion still exist; a few secondary points have in turn formed an issue; just now the main subject of discussion bears on the respective rôles played by the Parisian and the Picard schools. The question is of less importance territorially than chronologically; in both respects, however, it deserves careful consideration. No investigations can be idle that concern one of the greatest events of monumental history.

The intersecting rib or ogival arch and the broken arch, joined, when the dispositions of the vaulting permit, to the flying-buttress, are rightfully regarded as the primordial and organic characteristics of the Pointed style. The union of these three elements was effected for the first time and with permanent results in France, and, to be more precise, in the middle basin of the Seine. On this subject there is no longer any serious lack of harmony. The only question is, Must the theatre of this evolution be restricted to a section with Paris as the geographical centre, and Poissy, Pontoise, Creil, Senlis, Meaux, Étampes, and Dourdan as the boundary towns, or should the field be so extended as to include Beauvais, Clermont-en-Beauvaisais, Noyon, Soissons, and Laon, and should the true home of the movement be located within the zone thus added?

Adopting the first hypothesis, we find but four existing monuments offered for study: Saint-Louis, at Poissy, is the starting-point, Saint-Denis the other terminus, the choirs of Saint-Martin, at Paris, and Saint-Maclou, at Pontoise, are the intermediary landmarks.

Saint-Louis, at Poissy (Fig. 7), comprises a triple-aisled nave terminated by two towers,— one on the west and the other in front of the choir,— an apse with a deambulatory, and three chapels, one of which rounds into a horseshoe on the axis at the very extremity of the church; each of the other two consists of a somewhat irregular quadrangular division, on which opens a small apse. In their *ensemble*, the two lateral chapels, attached in a way to the deambulatory and inclined toward it, take the place of a transept. No account need be taken of the chapels of the nave and of the porch, which are later additions, nor of the recently built apsidal chapel, nor of the upper parts of the apse, which belong to the latter part of the twelfth century. In regard to the two towers, the only points that we note especially are their unusual disposition, which reminds us of Limousin, and the octagonal form of the central one, with the octagonal faces narrower than the four others. Let it also be remarked that we have now entered the twelfth century, and that at that period central and octagonal towers had won their way.

Everything at Poissy betrays the hesitation and want of skill of an architect absolutely inexperienced in the use of the rib, but, on the other hand, an excellent constructor. This element was then almost unknown, and he could not have seen more than two or three rudimentary and isolated examples of it, if, indeed, the idea did not suggest itself to him. He was evidently reluctant to adopt it, whether he questioned the artistic effect, or whether he encountered some obstacle to its efficacious employment. He attempts to dispense with them in the vaults of the deambulatory, fearing, doubtless, that the flaring plan of the bays may compel him to raise the central key too much or depress the diagonal arches unduly; he contents himself here with the constructed Roman intersecting vault, but he obtains only a section of an ellipse on the walls, which he accentuates by means of a prominent *formeret*. The Roman intersecting vault is continued in the side-aisles, and here it is less ill-shapen, as the plan is a rectangle. Still more striking evidence of the indecision of the architect appears in the capitals, which, in the clusters of colonnettes along the walls of the nave and the deambulatory, are turned obliquely, as though they had been intended at first to support ribs.

In the lateral chapels, fulfilling the functions of a transept, ribbing appears in connection with vaults that are moderately convex in the quadrangular divisions and very markedly so in the hemicycles. The master-mason, not knowing what degree of resistance the ribbing might offer, on the one hand, made it quite powerful, while, on the other, he so arranged the sections of the vault that they would support one another as far as possible by their own mass, as though the aid of the ogive (*arc-ogive*) was to be counted on but little.

The decidedly oblong plan of the bays of the nave, in its turn, presented some difficulties. The influence of the Roman intersecting vault is apparent there, notwithstanding the ribbing, for the juncture of the lateral vaulting sections with the walls forms an ovoid figure approaching that of the broken arch; but this is not, however, emphasized by projecting *formerets*, as it is in the deambulatory.

The broken arch itself does not occur in any of those parts of Saint-Louis which antedate the close of the twelfth century. Its absence was one of the chief hindrances to the constructor, who probably had seen it or had found it under his compass, but who thought that he had already gone far enough, if not too far, as an innovator by introducing ribbing into his structure.

In the vaulting of the choir of Saint-Martin-des-Champs, at Paris (Fig. 8), which has a deambulatory and chapels, the broken arch is almost exclusively employed for supporting or framing arches. The indecision referred to above is not exhibited, except in the skeleton of the vaults, in several of which the arrises are bare, although their curve differentiates them from the Roman groined vault. Here, again, we encounter an artist who had no models; neither in the rather peculiar plan nor in the profiles do we detect traces of a direct importation from Poissy. The profile of the ribbing, formed of a heavy torus, is that which prevailed down to the beginning of the thirteenth century. The central apse at Saint-Martin seems, as at Poissy, to have been executed or rebuilt in the second half of the twelfth century.

In Saint-Maclou, at Pontoise, there is also a choir with a *chevet*. But, at Pontoise, all evidences of wavering in the establishment of the vaults and all oddities in the plans have disappeared. Corresponding to each of the five bays of the deambulatory is a very shallow, small apse, connected to the bay itself by a common vaulting compartment with five ribs.

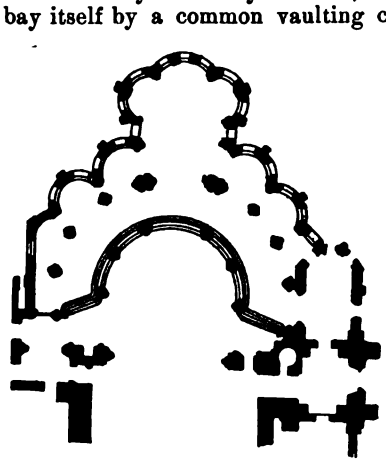

Fig. 8. Choir of Saint-Martin-des-Champs.

The junction is quite laboriously accomplished: to reach the central key, the rib running from the rear of the chapel is necessarily too long, and the *ensemble* has, consequently, a certain clumsiness, which, in addition to the ugly effect, jeopardized its stability, for nearly all the ribs had to be restored or renewed in the fifteenth century. The vault of the central apse was also rebuilt in the fifteenth century, so that neither at Poissy, nor at Saint-Martin of Paris, nor at Saint-Maclou, do we possess the original vaults of the upper hemicycle. We shall be no more fortunate at Saint-Denis; there, as in the preceding types, we shall not be able to go higher than the arches of the side-aisles.

We have just called attention to the fact that at Pontoise a

[1] From the French of Anthyme Saint-Paul, in Planat's *Encyclopédie de l'Architecture et de la Construction*. Continued from No. 891, page 37.

rib runs from the rear of each chapel; it follows the axis, while, at the same time, it divides the hemicycle into two parts. This even division, which also occurs in the apsidal chapels of Saint-Martin-des-Champs, is worthy of note; it is one of the most marked of the indications that enable one to recognize the edifices which were the forerunners of the basilica of Suger, and those which, more or less directly, emanate from it.

It is deeply to be regretted that we have no documentary testimony as to the dates of the three church-choirs cited above. We know that toward 1060 Henry I caused the monastery of Saint-Martin-des-Champs to be erected; but the present choir, considering the advanced character of its sculpture, and comparing it with authentic or unquestioned types of this king's reign, cannot, apparently, date back of 1130. This would not by any means be the sole example of a religious edifice constructed during the eleventh century, and rebuilt less than a hundred years after its completion. During the twelfth century many choirs, especially, proved to be defective — some in size, owing to the concourse of pilgrims attracted to the their resources, — there was at Morienval, at the close of the eleventh century, an apse in the narrow collateral of which [see *Eglise*, Fig. 36] ribbing was found in connection with the broken arch. The nave of Saint-Étienne at Beauvais [see *Eglise*, Fig. 35], that at Bury, the chapel of Bellefontaine, near Noyon[1] and, in part, the churches of Noël-Saint-Martin and Cambronne, Saint-Évremond at Creil and three or four others furnish, it is said, the intermediary landmarks, and the most recent of these structures is said to have been founded even earlier than Saint-Louis of Poissy. The archaic character of the sculpture and of the profiles in most of these edifices appears to justify their reputation for comparative age. Again, according to this hypothesis, the choir of the abbey of Saint-Germer, which has a *chevet*, tribunes and triforium, is the earliest, with that of Saint-Denis, where the three elements of Gothic architecture were employed on a grand scale and with consummate skill.

The adoption of one or the other of these theories is not a matter of indifference. With the first, we start from about 1125, and from the banks of the Seine, hardly quitting the

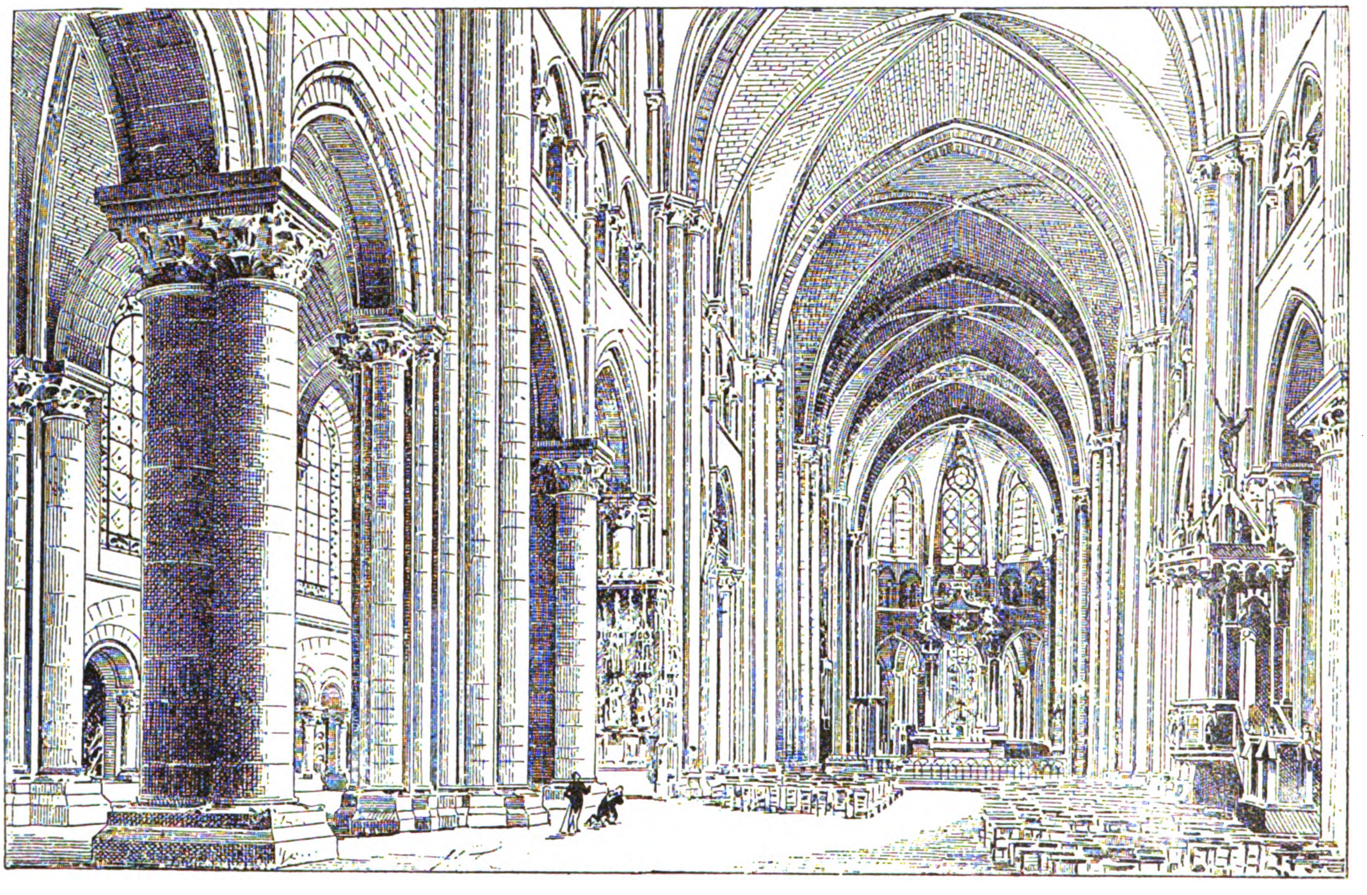

Fig. 9. Choir of the Cathedral of Sens.

churches to view the relics brought from the East, others in beauty, on account of the great progress made in architecture. On the first occasion that presented itself they were quietly replaced by more spacious and less barbarous constructions, and no care was taken to preserve a record of the original works. Thus it was at Saint-Germer and in Saint-Vincent at Senlis; nor was the cathedral that was being completed at Chartres when the fire of 1194 broke out the one so much vaunted by Fulbert, whatever might be inferred from the silence of the chroniclers on the subject.

Neither does Poissy reach back to the eleventh century; though the vaulting system is rudimentary, the rest of the church is not, and it would be hazardous to do the edifice the honor even of attributing it to the early years of the reign of Louis le Gros; 1125 seems to us the least improbable date; what we have elsewhere termed "the active transition" would then have begun with the second quarter of the twelfth century. This is wholly at variance with the second hypothesis, which is as destitute as the first of documentary support, but rests on investigations that demand an examination. According to this theory, whose expounders are men of genuine talent and cautious criticism, — men who have not yet exhausted all

stream to take in Pontoise; with the second, we gain more than a quarter of a century and are transported into Valois, Soissonais and Beauvaisais, that is, into the very centre of the Picard school. Moreover, the second hypothesis makes the broken arch appear at the same time with the rib; yet the former must have been common enough toward the year 1100 in the architecture of Picardy, for it seems difficult not to refer to this period a few of the naves where we have found the windows set astride the pillars; and in some of these the semicircular form has been abandoned in the longitudinal arches (Saint-Denis at Crépy-en-Valois, Champlieu, Orrouy, Plailly).

It seems to us that by lopping off a few years from the age of the Picard group the two theories might be so harmonized as to form a basis for new views and suggestions. We wish to express frankly our own ideas on the subject. We believe, in fact, that there were two parallel movements resulting from a common impelling force that started about 1110 or 1120, from one of the dioceses of Senlis, Soissons, Noyon, or Beauvais. In yielding to this impulse the architect of the church

[1] This chapel seems by exception to have its date fixed by a charter of 1125, which grants permission to build it. But it is possible that no advantage was taken of the permit until ten or fifteen years later.

of Poissy would naturally have attempted to give it a peculiar direction; but the dominant influence would not have come from him. The two currents are well defined about 1140. In this memorable year Saint-Martin-des-Champs produced the choir of Saint-Denis, and Poissy the choir of the cathedral of Sens. Now, the choir of Saint-Denis is of far greater importance in the history of art than is that of Sens, and Saint-Martin-des-Champs, which apparently was the forerunner of Saint-Denis, is, by an anomaly that has been but little remarked until recently (we pointed it out in 1876), a genuine Picard edifice, quite isolated in the Parisian school proper; the style of the mouldings and ornamentation leaves no doubt on this point. Consider also the form of the ribs. An imitation of Poissy would have given a profile with two toruses separated on the intrados by a fascia or fillet, while at Saint-Denis it is the big torus (*boudin*) of the Picard school that is plainly preferred.

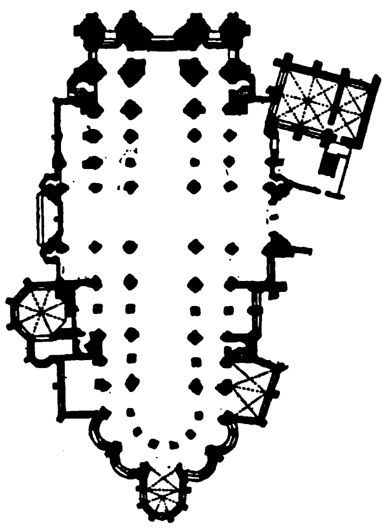

Fig. 10. Cathedral of Senlis.

All the structures which we have cited as having ribs prior to 1140 are merely transitional, for they all betray a certain hesitancy and a certain barbarism in the handling of the ogive, as well as the pointed arch. We find the architect master of his methods and sure of himself only at Saint-Denis, the church which was termed in 1863, by Felix de Verneilh, "the earliest of Gothic monuments." This designation is applicable only to the choir (see *American Architect* for August 2, 1890, "Religious Architecture," Fig. 3), although in our opinion there is nothing of the Romanesque remaining in the narthex, which was erected from about 1130 to 1140. Quite unlike the narthex, the choir is a complicated construction and it is certainly the first in which all the difficulties attendant upon the establishment of ribs over a complete and spacious apse were met and overcome. These difficulties were the greater because there was no time for making experiments and feeling one's way. Suger was in a hurry; the work, begun July 14, 1140, was entirely finished — crypt, upper *chevet*, tribunes, high windows, main vaulting, and roofs — at the end of three years and three months.

Fig. 11. Church of Saint-Germer.

To make the crypt lower and strengthen the vaults which were to support a pavement, Suger adopted the Roman system of intersecting vaults, and almost everywhere also he made use of semicircular forms. In the upper *chevet* all compromise has disappeared; evidently the master-mason who conceived and executed the plan did not make his maiden effort here, or he had studied profoundly the system he was called upon to apply on a scale hitherto unknown. The deambulatory, preceded by a rectangular bay with double collaterals, comprises seven bays, corresponding to which are as many chapels of uniform size and directly connected by a second circular collateral. The chapels are not deep; they have four divisions, two of which are taken for the connecting passage. The pillars are composed of simple, elegant, monolithic columns, with foliated capitals; — two or three only have subjects borrowed from the animal kingdom. The ribs are a simple torus; the broken arch is invariably adopted for all the arcades and bays. There are no tribunes, but an examination of the narthex shows that they once existed: as to the main vaults, we learn from a very clear, and consequently very valuable, passage in the writings of Suger, that they were ribbed, and even that the ribs were put up before the construction of the triangular spandrels. Finally, the buttresses projecting outside between the chapels could hardly have served for anything but bases to flying-buttress abutments.

In the same way that Saint-Denis, through its choir, built by Suger, is the first of Gothic monuments, Saint-Étienne of Sens (Fig. 9) is the first of Gothic cathedrals. The foundations of the cathedral were laid at the same time (1140) with those of the choir; but the work at Sens moved much more slowly and the architect employed less advanced or less substantial processes. The plan is that of Poissy enlarged: false transeptal arms, each with one small apse, a horseshoe-shaped terminal chapel, and a deambulatory with very flaring bays [see "*Cathédrale*," Fig. 20]; the transept was added at the beginning of the sixteenth century. The semicircular form occurs together with the pointed in the great arches; several ribs are awkwardly disposed and the transeptal part of the structure, or at least the small apses, seems never to have had any. The profiles of the ribs with double toruses is derived from Poissy. It is interesting to note that at Sens the peculiar influence of Saint-Denis also appears; this is in the façade. Saint-Étienne, in its turn, furnished the model for the elevations and profiles of the choir of Saint-Germain-des-Prés at Paris, which was consecrated in 1163; but the family is limited to this trinity.[1]

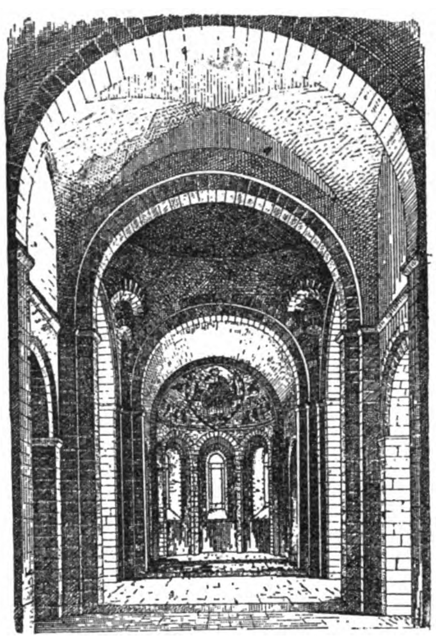

Fig. 12. Interior View of the Church of Saint-Loup-de-Naud, after a Photograph by M. E. Durand.

On the contrary, the Saint-Denis of Suger groups around itself an illustrious and numerous progeny, which, like the mother edifice, had a preponderant part in the direction that the new style was destined to take. In its equally divided chapels, Saint-Germain-des-Prés quits Sens and returns to Saint-Denis. The architects of the cathedrals of Senlis (Fig. 10) and of Noyon [see "*Cathédrale*," Fig. 33] did not design their choirs until they had seen Saint-Denis; Notre-Dame of Senlis might even pass for a genuine copy. The peculiar type of a series of equally divided shallow chapels may be, or might be, followed through Saint-Martin of Pontoise (an abbey-church now destroyed), through Saint-Leu-d'Esserent, and, outside the School of Ile-de-France, through Vézelay, whose choir was reconstructed toward the end of the twelfth century, and reproduces the chapels even to the communicating passage (see *American Architect* for July 26, 1890, "Religious Architecture," Fig. 22), through Saint-Étienne at Caen, in which the passage likewise exists, and through Ébreuil and Saint-Pourçain, on the very soil of the school of Auvergne.

We need not touch step by step on the modifications and ramifications that finally, about 1200, rendered it impossible to recognize this origin. The individual stamp of the French school disappears in the cathedrals and great basilicas; to follow its trace we must turn to the smaller edifices, glancing at the more important ones merely to determine the purely

[1] In France; but in England it includes the choir of Canterbury cathedral, whose architect, Willian, was from Sens (see *American Architect* for August 2, 1890, "Religious Architecture," Fig. 7).

local influences. There are two churches, however, which are not to be classed under the transitional movement, and which amply merit the few lines that we cannot refrain from devoting to them. One is the church of Saint-Germer, between Beauvais and Gournay (Fig. 11), constructed, as we believe, between 1140 and 1160: though it may have transmitted little or nothing, it has at least accomplished much for itself. Ribbing is adopted and even emphasized, as well as the pointed arch, by geometric designs. With all that, it is difficult to understand how the master-mason could have made use of the Roman intersecting vault with the semicircle for the tribunes and rectangular bays for the triforium.

The other church, that of Saint-Loup-de-Naud, near Provins (Fig. 12), is simply a sort of *pot-pourri* of all the vaulting systems that were known in the middle of the twelfth century: tunnel-vault, cupola, bare arrises and ogives; and nothing justifies us in assigning to it the rôle that we once thought it might play.

(To be continued.)

ARCHITECTURAL SHADES AND SHADOWS.[1]—XVII.

CHAPTER XII.

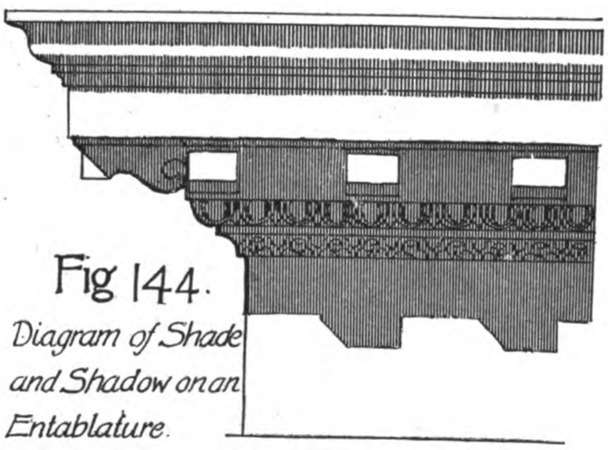

Fig 144. Diagram of Shade and Shadow on an Entablature.

The rendering of architectural shades and shadows. Reasons for detailed rules; the conventional character of architectural elevations and consequent conventional assumptions as to conditions of illumination, etc. Architectural rendering an art, based on science. The interpretation of values; usual procedure; phenomena of reflected light, reflected shadow, contrast, and aërial perspective. Concluding remarks.

216. A careful review of the methods and rules for architectural shadow-casting hitherto given in these papers will reveal the fact they are all in reality special solutions of three general problems of descriptive geometry, which may be stated as follows:

1. Given a line passing through a given point in a given direction; to find its intersection with a given surface.
2. Given a line of shade and rays passing through it in a given direction; to determine the surface they generate (that is the shadow-in-space), and its intersection with other given surfaces.
3. To find any number of tangents at a given angle to a given surface, and to determine their intersections with other given surfaces.

217. The first problem is that of the shadow of a point on a plane or other surface; the second, that of finding the shadow of an object whose line of shade is known; while the third is the general problem solved by the "Method of Slicing." And as the latter method covers all imaginable architectural forms not susceptible of treatment by the first two, it appears that the whole science of architectural sciography is but an expansion of these three problems.

218. The reasons for thus expanding three elementary problems into a whole science are the same that underlie nearly all branches of mathematics which are composed mainly of special applications of a very few fundamental rules or principles. The skilled algebraist is the man who has thoroughly mastered the various abridged and "short-cut" methods of applying those general equations which are the basis of the science. These general equations are themselves of little service in the ordinary operations of algebra, being too cumbrous and complicated for common use. In the same way the draughtsman's work is greatly simplified by substituting for the solution of the three general problems above specified a large number

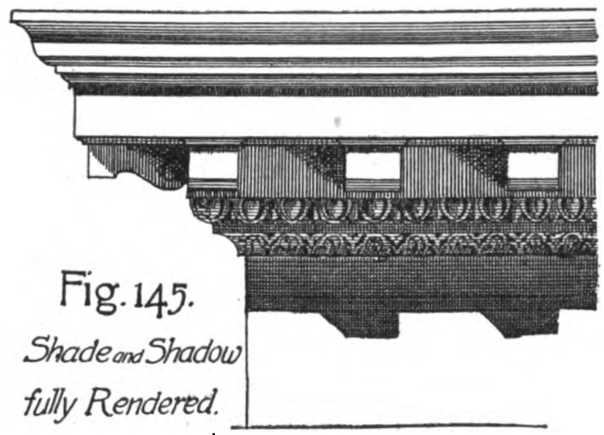

Fig. 145. Shade and Shadow fully Rendered.

of special solutions derived from them, each briefer and simpler than the more general one on which it is based. This explains how and why these papers have so largely consisted of special rules for each of the principal geometric forms out of which architectural design is mainly built up, and of special examples or applications of the "slicing method," and of one or two other methods more or less general in their nature.

219. Moreover, architectural sciography is a special branch of the general science of shadow-casting, by reason of the somewhat limited range of geometric forms and surfaces it deals with, and their occurrence usually with planes and axes parallel or perpendicular to the plane of projection, or at 45° to it, and by reason, also, of the uniform assumption of a special and conventional direction for the light. To these two conditions we owe a whole series of abridgments and simplifications of the general problem, and the possibility of formulating in the eighteen rules previously given a sort of alphabet of architectural shades and shadows.

220. And, finally, the architectural applications of these three problems are further specialized by the purpose in view, which is to represent, or rather, to suggest, the third dimension in plans, elevations, and sections by a conventional presentation of the lights, shades, and shadows, both direct and reflected. This purpose lifts the work of the draughtsman above the level of mere descriptive geometry, in which mathematical and quantitative considerations

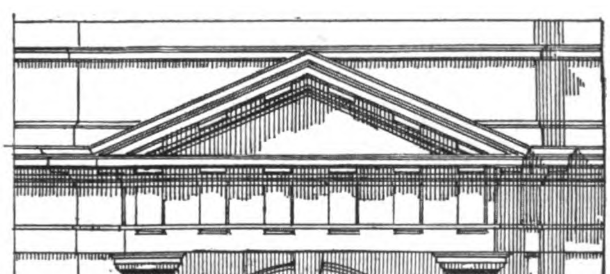

Fig. 146. Porch with Shades & Shadows in one flat Tint.

predominate. While these necessarily appear in architectural sciography, they are merely means to an end, in which qualitative and æsthetic considerations are dominant. It is in order to relieve the draughtsman as far as possible from the necessity of abstract mathematical operations and investigations that so many special rules

[1] By A. D. F. Hamlin, Adjunct Professor of Architecture in the School of Mines, Columbia College. Continued from page 40, No. 877.

Note.—[In view of the inconvenience of having to refer to back-numbers for explanations of the notation used in these papers, the following memorandum will be found of service.]

HP= horizontal plane of projection; *V' P*= vertical plane of projection; *GL*= ground-line or horizon. Capital letters designate points and lines in space, small italics their horizontal projections, and the same accented or "primed," their vertical projections. Subscript figures indicate points of shadow; small figures above the line indicate points of shade. Greek letters (α, β, γ, θ, δ,) designate angles. The *diagonal* of a line or dimension is its length multiplied by $\sqrt{2}$. Shadows are indicated by vertical shading; shades by horizontal shading; shearing light by oblique shading parallel to the projections of the luminous ray.

formulas and methods have been introduced into these papers; for these, once mastered, can be applied and used as matters of habit in the actual work of draughting, with no burden of complex reasoning and study to adapt general methods to each special case.

221. The scientific work of the draughtsman ends when he has pencilled on his elevation or section the outlines of his shades and

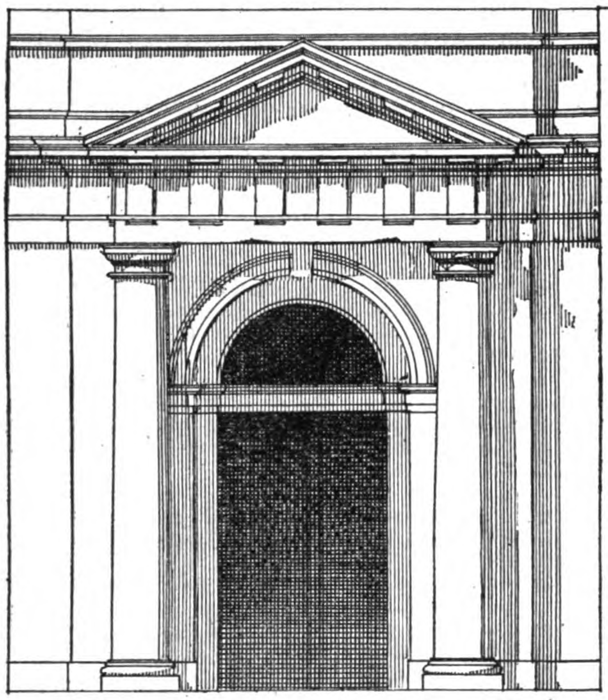

Fig. 147. Same as 146, with darkest darks added.

shadows. With the first brushful of India-ink or color applied to the drawing so prepared, his work as an artist begins. No amount of minute accuracy in the outlining of the shades and shadows will suffice to make the drawing a work of art, such as every rendered plan, elevation and section ought to be, unless the rendering itself be guided by a true artistic sense, and carried out with feeling and discernment. It is in this part of the work, and by no means in the mere accuracy of their geometrical operations, that the French draughtsmen are preëminent.

222. Plate IX, taken from an engraving in the *Moniteur des Architectes*,[1] derives its charm not merely from the beauty of its subject — the entablature of the so-called temple of Concord at Rome — but quite as much from the perfection of its rendering. Like the Ionic capital in Plate VII (No. 874, *American Architect*), it is the work of a *pensionnaire de Rome*, M. Dutert, and represents more faithfully and perfectly than the attempted *fac-simile* in Plate VII the original work of the master. We have here no mere diagram of descriptive geometry, but a work of art of a very high order, in which fine and exact drawing is supplemented by a remarkably beautiful presentation of varied intensities and gradations of light and dark, which give to the whole almost the vividness and relief of a perspective. And the reader who turns to the issue of the *American Architect* for November 12, 1892, will find in the beautiful drawings by M. L. Parent, of a residence in Paris, another admirable illustration of the quality and value which even a cross-section may acquire when the shadows are cast and rendered by a true artist.

223. While the artistic faculty can neither be created nor communicated by a text-book, nor the poetry of draughtsmanship taught in writing any more than the art of poetry in literature, architectural rendering has, like all the arts, certain fundamental principles and a basis of natural phenomena which can be formulated and taught. These we shall try to present in this chapter. Moreover, as architectural draughting is an art largely of convention, employing a purely artificial method of presentation and assuming purely conventional conditions, it is desirable to set forth clearly the limitations and the advantages alike which result from these assumptions and conventions.

224. When once the outlines of a drawing are completed, the controlling considerations in its subsequent treatment are those of intensity or value of both light and shade. The mere tinting of shades and shadows with a uniform wash of gray or black does not produce a rendered drawing, but a mere diagram; an absolutely conventional presentation of geometric facts and dimensions (Fig. 144). Character, meaning, sparkle and charm are imparted to this diagram only by variations of tone. One shadow is intensified, another softened; here a shade is made luminous with reflected light, and there a reflected shadow intensifies the darkness. Certain high lights are left absolutely white; others modified by almost imperceptible tints; and decorative details otherwise lost in the deep shadows that fall across them are brought out by reflected lights and shadows and gradations of tint. Thus the projecting masses are made to stand out in bold relief, while the receding portions of the design retreat in their diminished brilliancy from the general plane of the picture. An illusion is produced, almost as of perspective, giving body and substance to what would otherwise be a flat and mechanical diagram.

225. All these effects are produced by variations of tint, especially in the shades and shadows. The comparison of Figures 145 and 144 illustrates the transformation effected by these varied "values"; and the same is shown by Figures 146, 147 and 148, which represent different stages of the same drawing. Plate IX is a further illustration and demonstration of the statements in the last paragraph.

226. The purpose of architectural rendering is, as we have said, to produce the impression of relief, to express the third dimension which any mere orthographic projection in outline fails to present. To this end the draughtsman avails himself of those phenomena which relate to the intensity of light, and which were briefly set forth in Chapter I.[2] In making use of these natural phenomena he assumes the conditions of each case to be such as will best subserve this purpose and produce the desired effect, emphasizing or exaggerating those conditions and phenomena which lend themselves to the end in view, and ignoring or partially suppressing the rest.

227. Such procedure, however illogical and indefensible in drawings from nature, in which an exact transcript of actual appearances is sought after, is in architectural drawing justified by the conventional character of all representation by orthographic projection. An elevation, a plan, or a section is not a realistic representation of form, but a purely artificial diagram of certain geometric relations between the forms it exhibits, as in a map. It presupposes an impossible point of view, *i. e.*, one infinitely distant; and however truthful as a diagram, as a picture it is false and incorrect. The object of all the arbitrary and contra-natural assumptions to which the draughtsman occasionally resorts in rendering his lights and shades is to correct this pictorial incorrectness; to rectify the falseness of an elevation or section, and, by assuming his conditions at will, to produce in his drawing a closer approach to truthfulness and reality than could otherwise be obtained.

228. To illustrate the procedure usually adopted, let us take a Doric porch or entrance on which the shades and shadows have been correctly outlined. The first operation, unless the draughtsman has had considerable experience, should be the application of a light preliminary tint of India-ink to all the principal shades and shadows indiscriminately. This tint should be substantially flat, and washed continuously without break over all contiguous areas of shade and shadow, whatever the interruptions of continuity in the architectural surfaces it covers. Figure 146 serves to illustrate this first operation, although the effect of its coarsely-lined shading is, in reality, quite different from that of a pale wash of India-ink. This

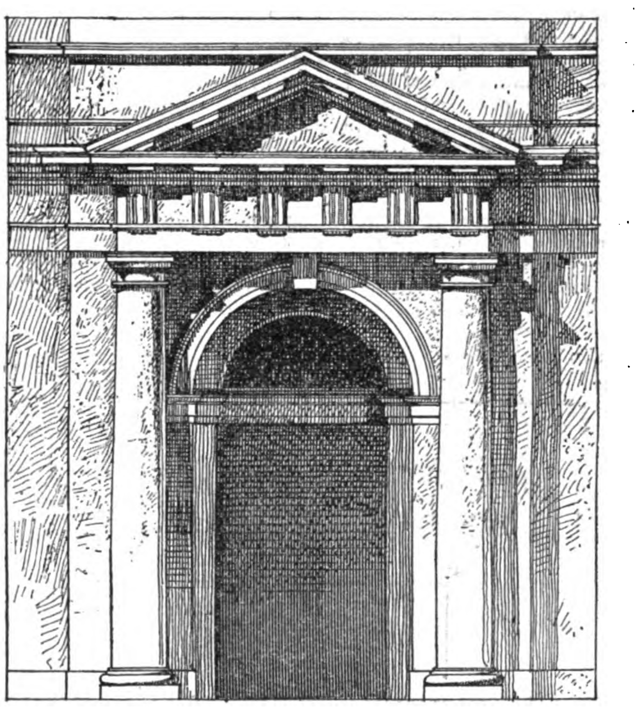

Fig. 148. Porch completely rendered with Graded Tints.

preliminary tint serves to distinguish and identify, from the outset, the forms and areas of the shades and shadows, and to lay a foundation for the subsequent washes to be laid over it.

229. This tint, when first laid, will appear darker than it really is, by reason of its violent contrast with the white paper. The

[1] Plate XI in the volume for 1878.

[2] No. 687 of the *Architect* for February 23, 1889.

draughtsman is often surprised at the timorousness of his earlier tints, when the presence of darker masses in later stages of the rendering has reduced their apparent intensity by substituting the contrast with black for the contrast with white. As a consequence, he is often obliged to go over and retouch and intensify these earlier

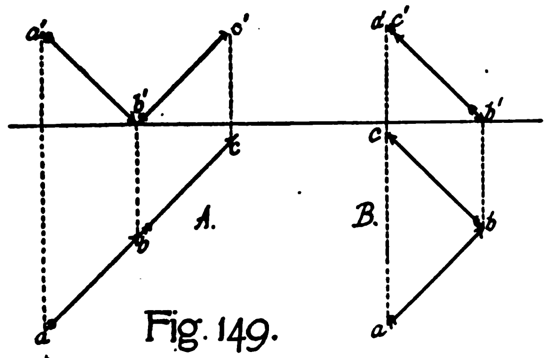

Fig. 149.

A. Theoretical direction of reflected light.
B. Assumed direction of reflected light.

washes, in order to bring them once more up to the tone he imagined them to have when he first laid them on the white paper. In order to avoid such wasteful labor, it is wise to correct at once the illusive contrast with the white by establishing a counteracting contrast with a strong "dark." To this end, the very darkest tints should next be washed in, such as are required for open doorways or windows. The drawing would, in the present instance, then appear as in Figure 147, in which the preliminary tint is noticeably paled by the dark tint of the doorway. Such dark masses not only lead the draughtsman to "key up" his subsequent washes to a sufficient strength of tone, but also furnish a limit of intensity which they may not exceed. They are the key to the intensity of the whole drawing, and should be made lighter or darker according as delicacy or power is aimed at in the rendered values.

230. These darkest portions are, in general, the doors and windows, or other openings of the building, since these reflect to the eye in most cases less light than any other part. Every one who has observed the effect of the unglazed openings in an unfinished building on a bright day has noticed their intense blackness, due partly to the contrast with the glare of the sunlight, and partly to the absence of any light reflected from the sky by glass to the eye. When the openings are glazed, their apparent darkness varies with circumstances. An uncurtained plate-glass window looks nearly black from the street, unless one be so placed as to catch the reflection in it of the sky or landscape, or unless the room be lighted by windows on other sides. Imperfect and irregular glass often presents, under the same conditions, a shimmering and confused mixture of white and black. Stained-glass and glass covered with dust absorb or transmit a part of the light, and reflect the rest in diffused rays, unlike the pure and sharp reflection from polished plate, and so present to the eye surfaces of a dusty gray, approaching blackness more or less, according to circumstances. Of course, all these conditions are changed by the presence of shades, blinds, or curtains behind the glass.

231. In order to give their proper architectural value to the voids in an elevation, it is customary to assume the absence of shades or curtains, and of all disturbing reflections from the glass. The windows are then rendered with strong washes of India-ink, sometimes tempered with a little blue, to give it coolness and depth, and graded somewhat rapidly downwards, in order to avoid a too heavy and monotonous effect. If the sash is divided into small

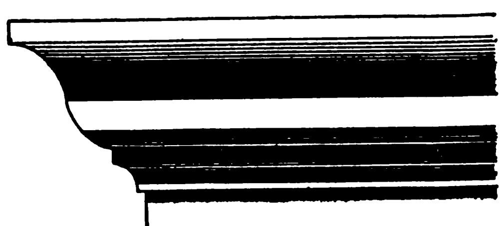

Fig. 150.

Shade and Shadow modified by Reflected Light.

lights the minor bars are suppressed as far as possible, for the sake of breadth and simplicity. It is also customary to render the shadows cast *on the glass* by the jamb and lintel of the window, using a still stronger tone of black. These serve to express the depth of the reveal, and to give mass and solidity to the wall. Without them, the windows appear as if set in the outer plane of the wall, and the whole effect is flat and unsatisfactory. Moreover, such shadows are quite justified from the point of view of realism, as any one may prove on a sunny day by careful observation.

232. The broadest and most important of the shades and shadows are next taken up, such as those behind colonnades and arcades, or those cast by projecting wings of the building. They are usually graded quite rapidly downwards, as though their lower portions were flooded with light reflected from the pavement. This has been done with the shadow under the arch, in Figure 148. In some cases, however, such shadows are graded in the opposite direction, being made lighter above than below,—not so much on any theory of an actually stronger reflection of light to the upper portions as for the sake of more agreeable or effective contrasts with the tones of other masses of adjacent shadow. When this is done with shadows behind arcades or columns the upper parts should not be made too light, as the result is apt to be an effect suggesting a glass roof of some kind as the only explanation of so strong an illumination of the upper shadows.

233. The exterior shadows on an elevation are usually graded quite rapidly downwards, both severally and in the mass. The same treatment is, in most cases, also applied to the "local color" of the building, so that all the tones, both of color and shadow, are strongest at the top and palest at the bottom. This treatment is justified by the fact that the upper parts of the building are seen against the brilliant background of the sky, and thus made darker by the contrast, while the lower portions are brightened by reflected light from the ground and from neighboring buildings, as well as by the absence of such strong contrasts with a brilliant background. There is also a practical reason for this downward gradation of shadows and color in the fact that the gamut of tones at the draughtsman's disposal falls far short of the range of values he is seeking to represent. Since it is impossible, with flat washes, to produce adequate contrasts in all the various parts of the drawing without too great intensity in the darker tints, the lighter of the contrasted tints must be made still lighter by grading it downwards.

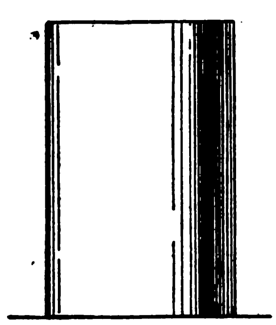

Fig. 151.

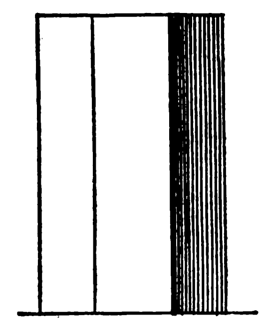

Fig. 152.

When this is done systematically throughout, it becomes possible at *some* point in every shade or shadow to obtain the required contrast with any other adjacent shade or shadow, whatever its tone. Moreover, this treatment adds greatly to the luminousness and transparency of the rendering, and is sometimes overdone in the effort to secure a meretricious brilliancy of general effect. Figure 148 illustrates measurably the gradation of shades and shadows, although on a limited scale.

234. Having so often, in the preceding paragraphs, alluded to the effects of reflected light, it is proper here to review briefly its phenomena, so far as they find application in architectural rendering, although they were treated of in the first of these papers as a part of the general subject of light and shade.

235. All illuminated surfaces reflect a portion of the light they receive, and are, indeed, only made visible by means of such reflection, except when they are transparent or translucent, and situated between the eye and the source of light. But, in general, the intensity of this reflected light is so low that it does not perceptibly illuminate or modify adjacent objects, which seem to absorb it,[1] instead of again reflecting it to the eye. From polished surfaces, however, the light is reflected with considerable intensity, and at a uniform angle equal and opposite to the angle of incidence, as in Figure 149, *A*. All unpolished surfaces, by their minute irregularities, break up the light they reflect into innumerable rays issuing in every direction, and constituting thus a mass of diffused light. The smoother and finer the texture the greater the amount reflected; so that a pavement of white marble or a sheet of paper will perceptibly illuminate shaded surfaces in its immediate neighborhood, where rough and coarse-grained surfaces would produce no such effect. In any case, however, the range of such reflected illumination is very limited, by reason of the general law that the intensity of illumination of surfaces varies inversely as the square of their distance from the source of the light.

236. We have remarked that all unpolished surfaces break up

[1] This is an apparent, rather than a scientific, explanation of the fact. The limits of this paper do not admit of a detailed scientific discussion of the subject, which the reader can find in any text-book on physics.

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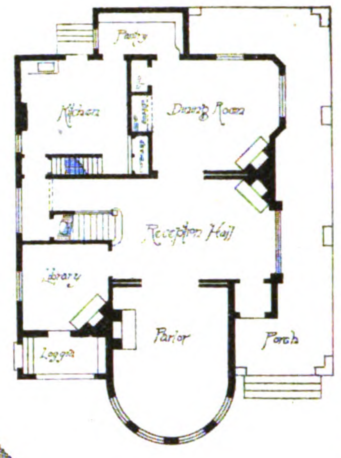

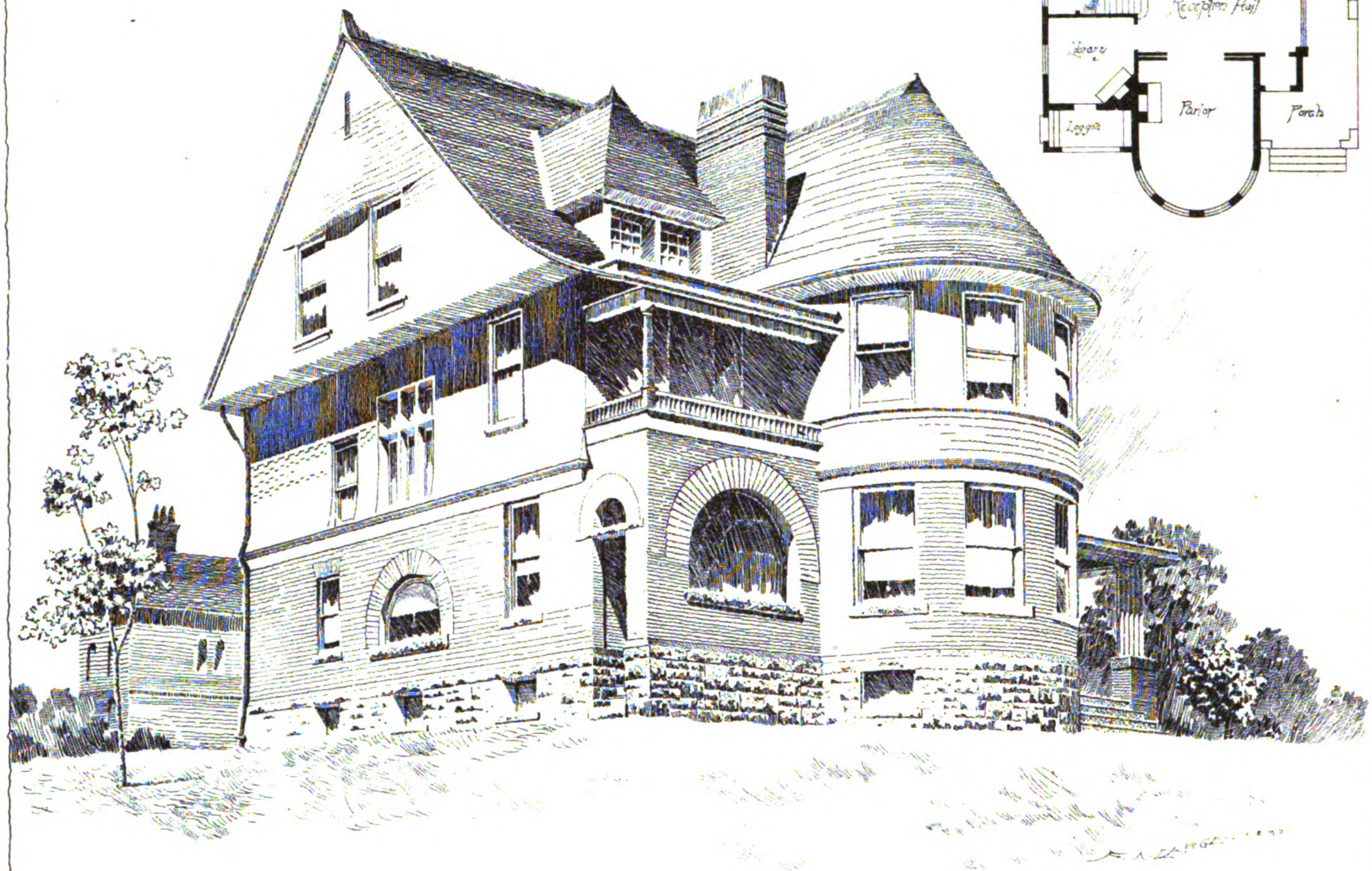

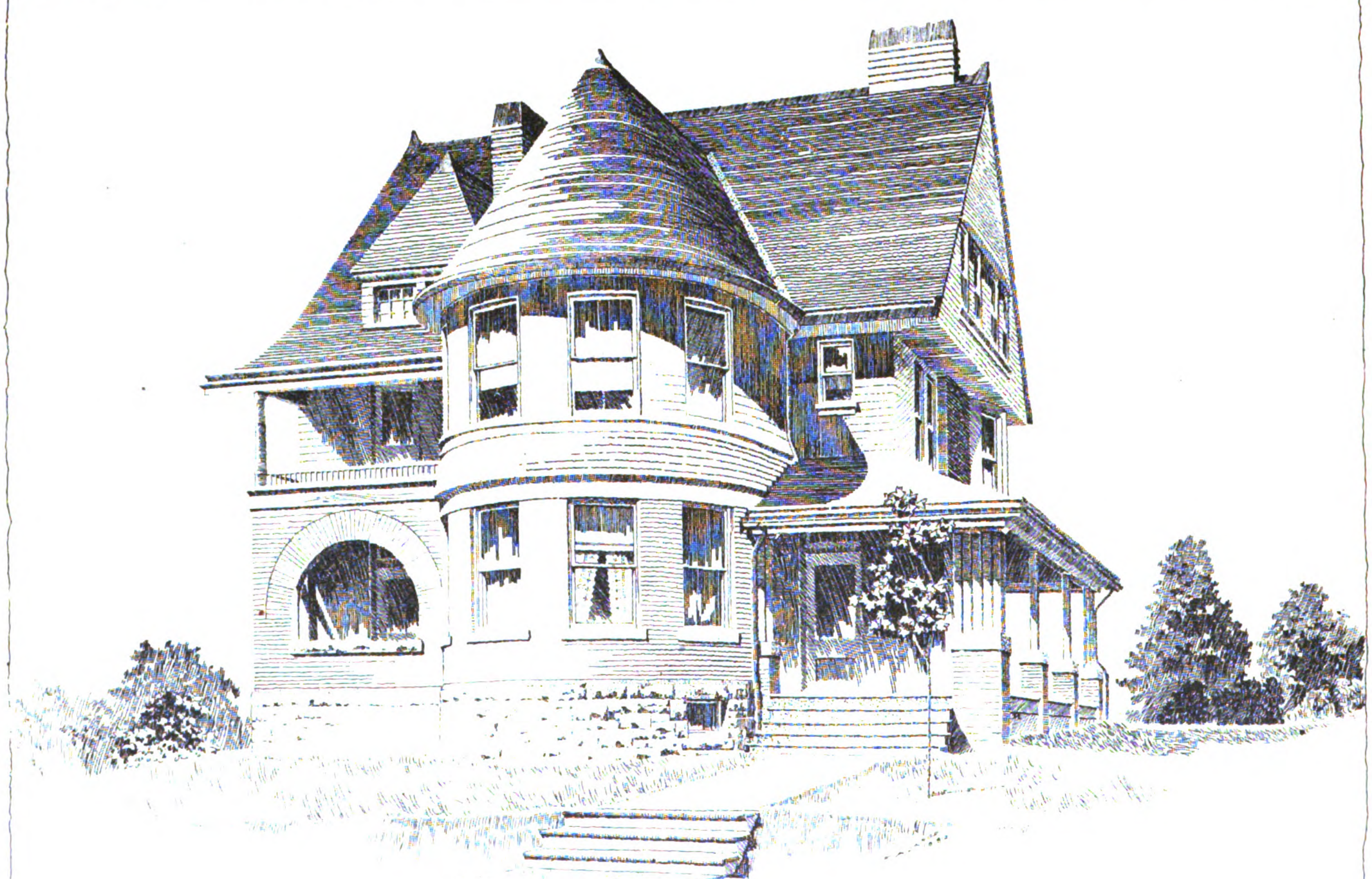

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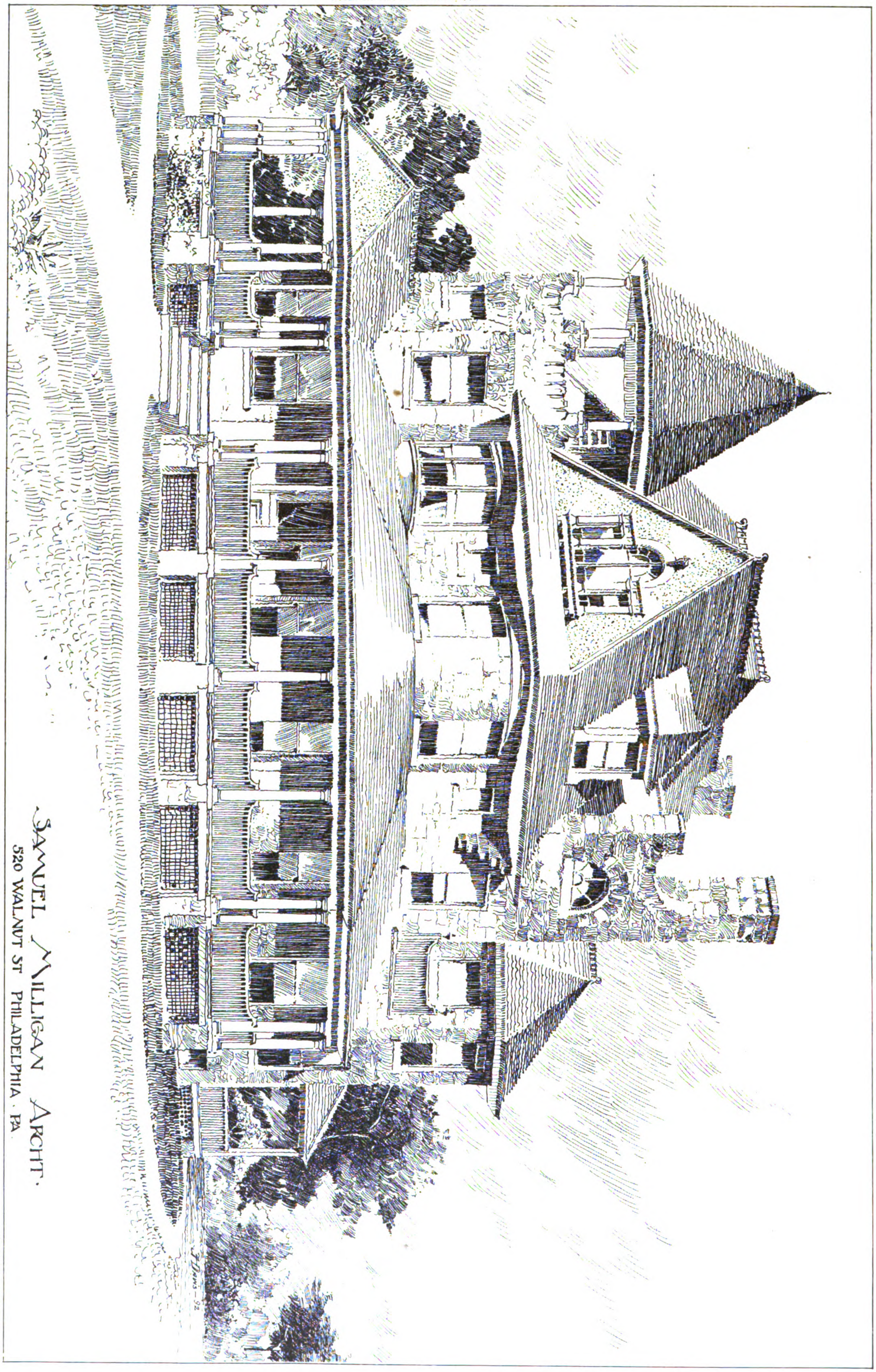

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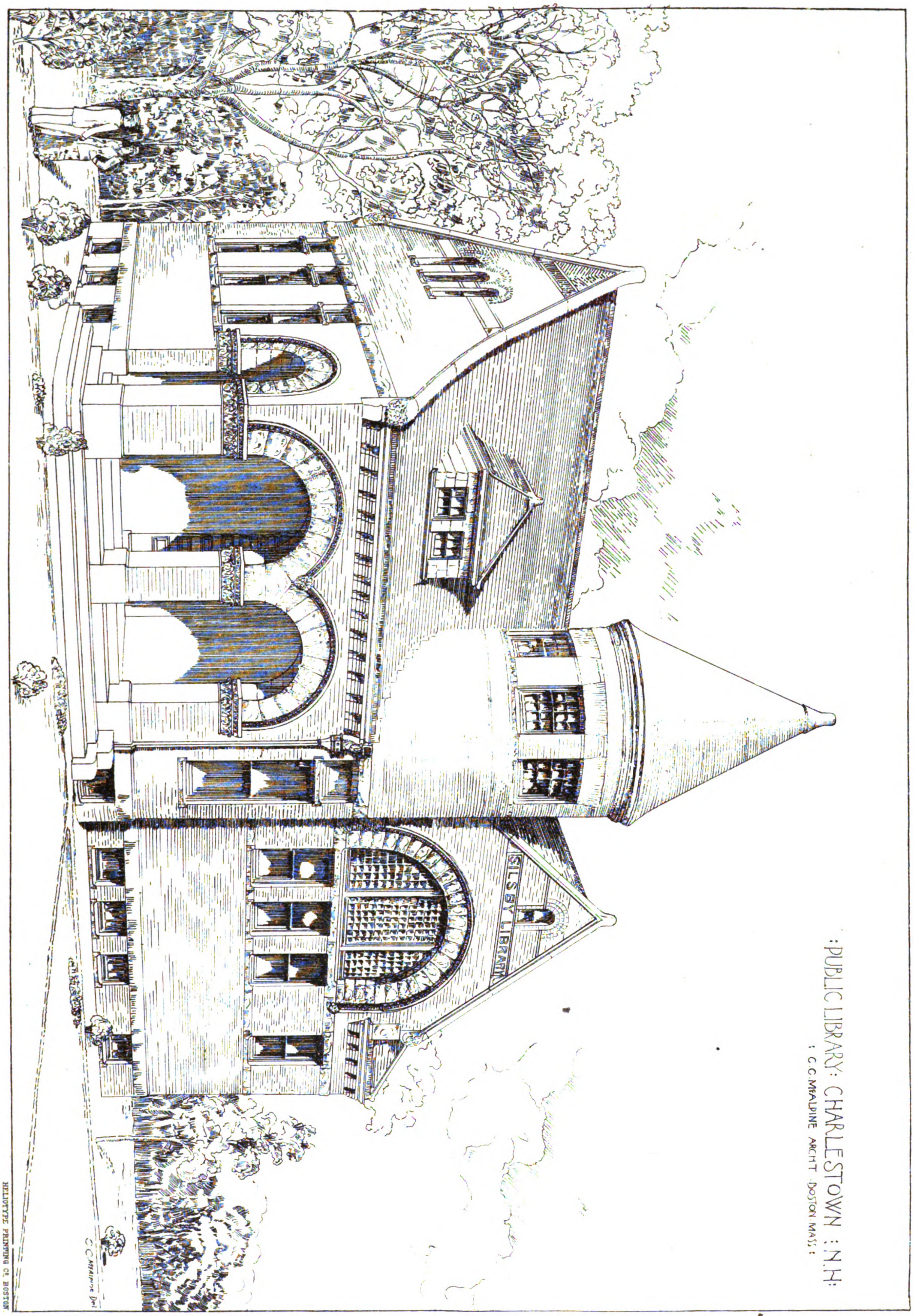
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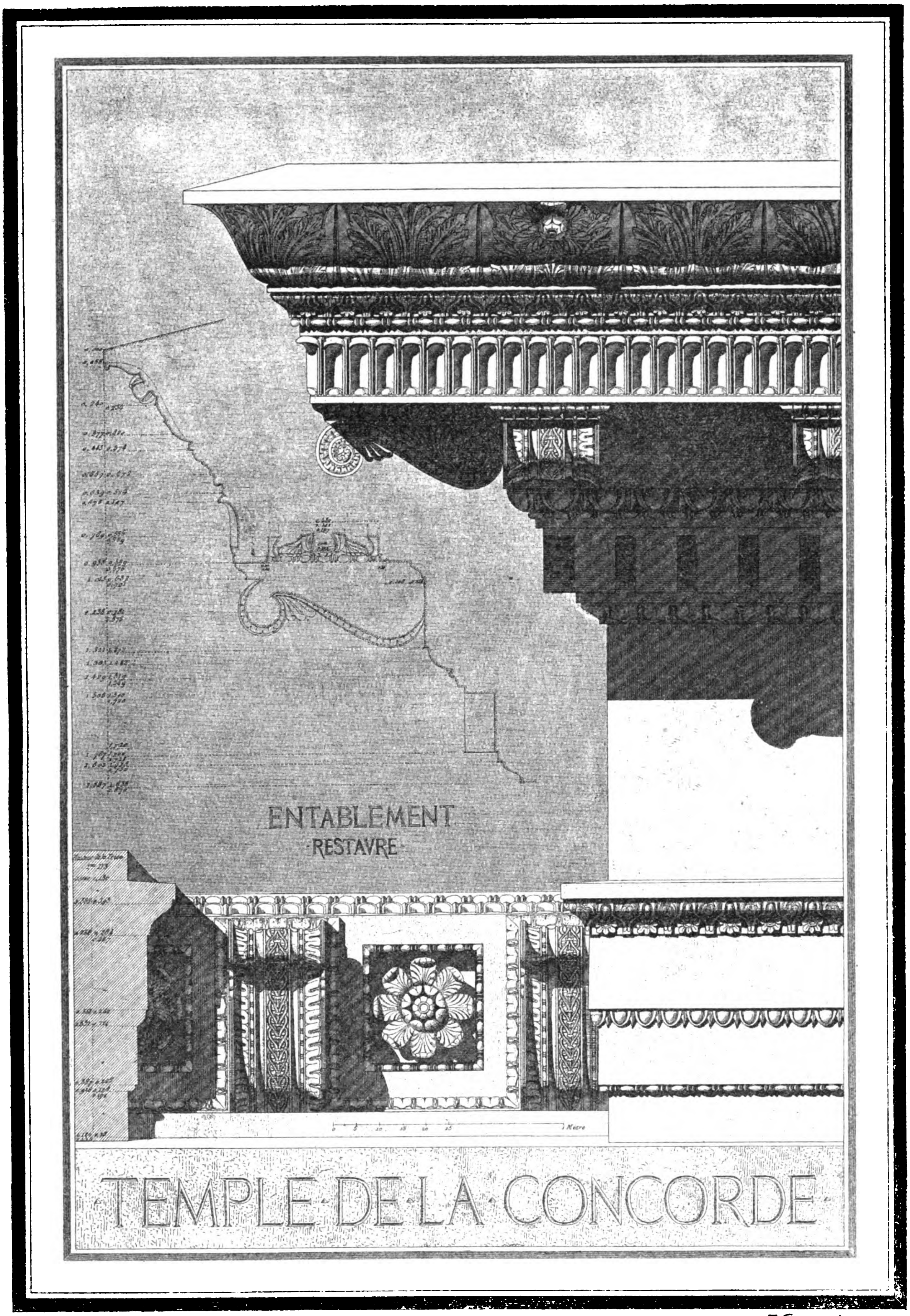
Shades and Shadows. Plate 9.



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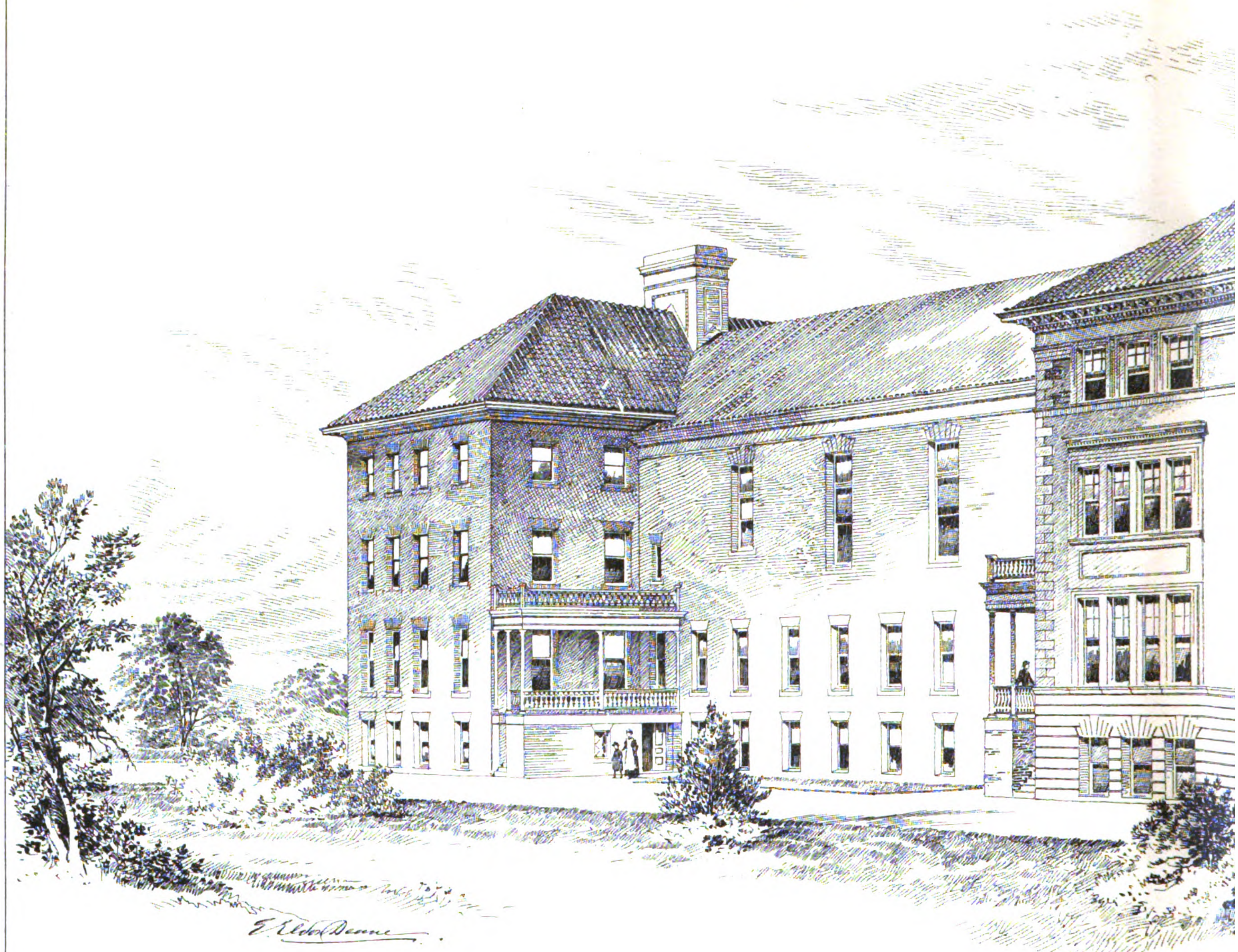

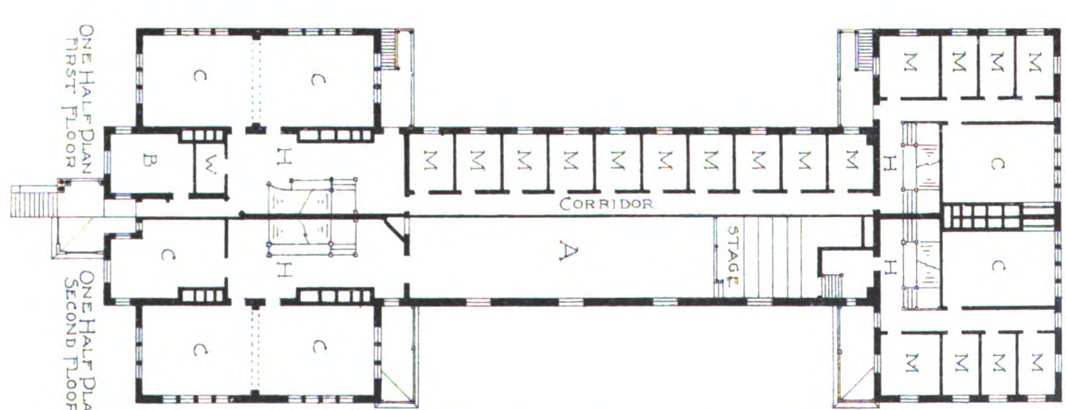

A - Auditorium
B - Reception Ro
C - Class Rooms
E - Entrys
F - Fans
G - Gymnasium
H - Halls
L - Library
M - Music Rooms
P - Play Rooms
R - Radiators
S - Sanitaries
W - Wardrobe

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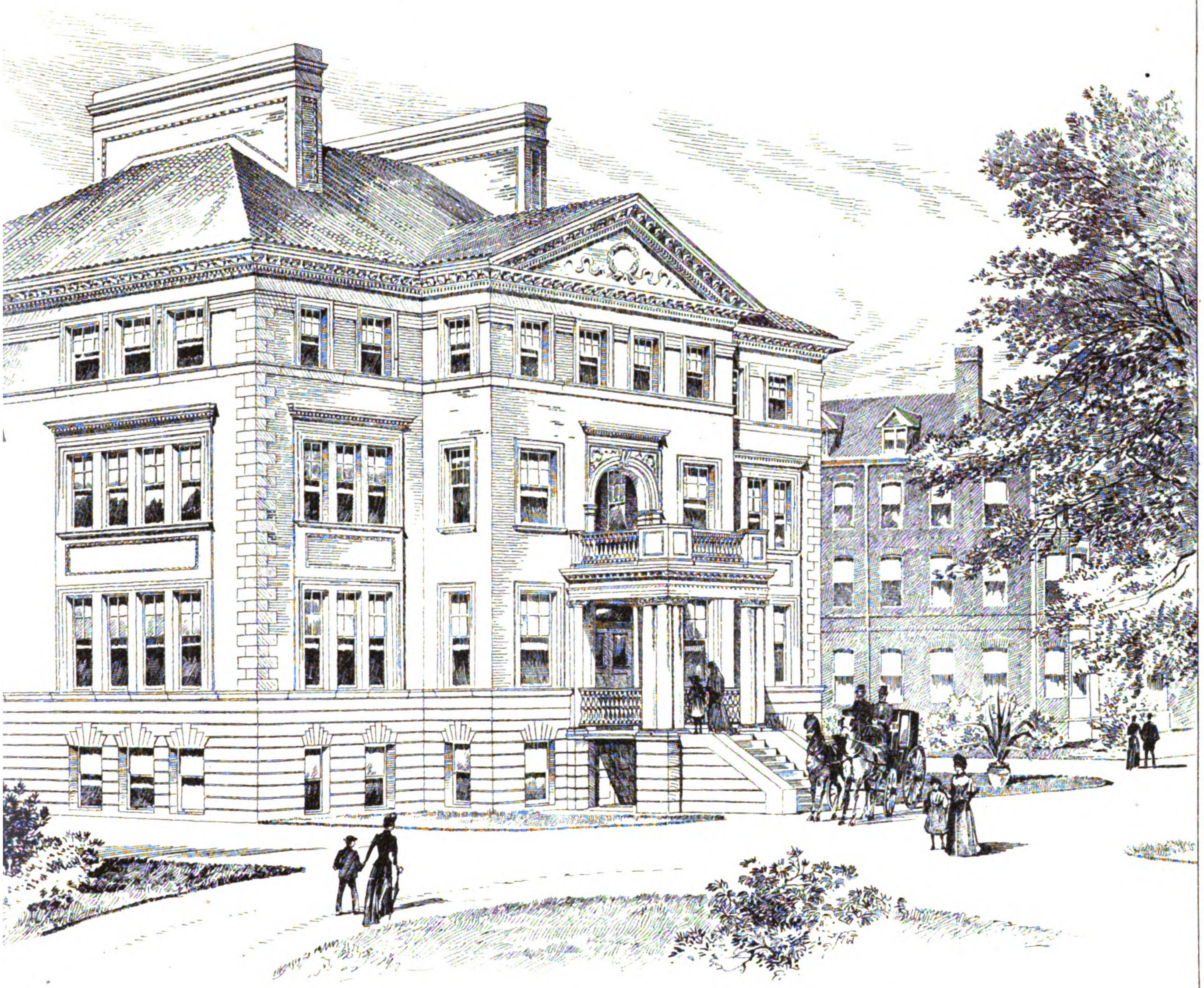

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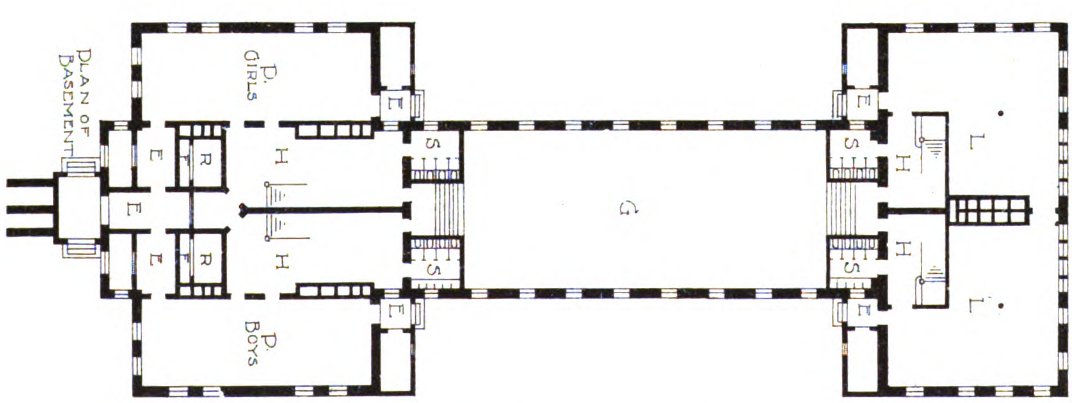

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the light they reflect, sending it forth as diffused light, made up of rays issuing in every direction from all parts of the surface. It generally happens, however, that there is a predominance of rays in one direction over all others, the light being less broken up by relatively smooth surfaces, and a larger proportion of the rays taking a particular direction, determined by the direction and texture of the surface in question. And it is obvious that, even when the reflection is considerably diffused, a pavement must reflect generally upwards, and a vertical wall on the lighted side of a street or court send back considerable light towards the shaded walls on the opposite side.

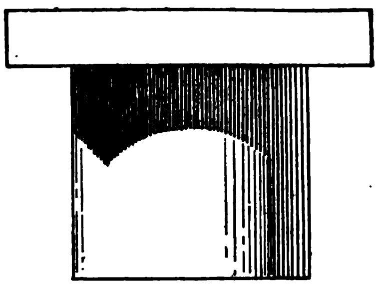


Fig. 153. *Shadow of Abacus on Shaft.*

237. As the draughtsman is at liberty to assume the conditions of texture at will, he may suppose the light reflected upwards from the ground to take a direction inclined to the left, and at an angle with the horizon whose projection is 45°. This would, of course, be impossible if the reflection were from a polished mirror, in which case the reflected ray would continue in the same vertical plane with the incident ray, and be projected as a line at 45° inclination to the right, as shown by the diagram *A*, Figure 149, instead of to the left, as at *B* in the same figure. In the latter case, which is the direction assumed by the draughtsman for the reflected rays, the same line in elevation is the projection of both the incident and the reflected ray.

238. The assumption of this as the predominant direction of the reflected light results in illuminating — or, to speak more accurately, in diminishing the darkness of — those surfaces turned away from the sun, *i. e.*, the surfaces in shade, as the reflected rays fall most nearly perpendicularly on such surfaces. Surfaces in shadow are, on the other hand, less affected, in general, by such reflection, being turned towards the sun, and therefore receiving the reflected light always at an angle more or less acute. Accepting this as a general principle, the draughtsman makes his shades in nearly all cases lighter than the shadows. Thus in Figure 150 the uppermost portion of the cymatium is in shade, and lighter than the lower part of the shading near the middle of the moulding, which is in the shadow cast by the overhang of the upper part, and the shadow on the fillet below the cymatium is darker than the shades above and below the fillet. In Plate IX the same is true of the cymatium and of the shade on the under part of the modillion-ends, as well as of that on the lower part of the egg-and-dart and water-leaf mouldings, all of which are lighter than the adjacent cast shadows. So, also, the shade on the under surface of the bay-window in Figure 154 and that on the columns in Figure 148 are lighter respectively than the shadows they cast.

239. It should be remembered that all such reflected light is extremely feeble in comparison with sunlight, producing no perceptible effect on lighted surfaces, and only partial mitigation of the tones of shades and shadows. Even the most luminous of shaded surfaces should therefore be rendered less bright than even the palest of those in light. The draughtsman must be on his guard against the temptation to exaggerate the brilliancy of the reflected lights, and to make certain shaded surfaces actually lighter than those in half-light or shearing light. Allusion has already been made to the danger of exaggerating its effect in the general downward gradation of the tints of the whole drawing.

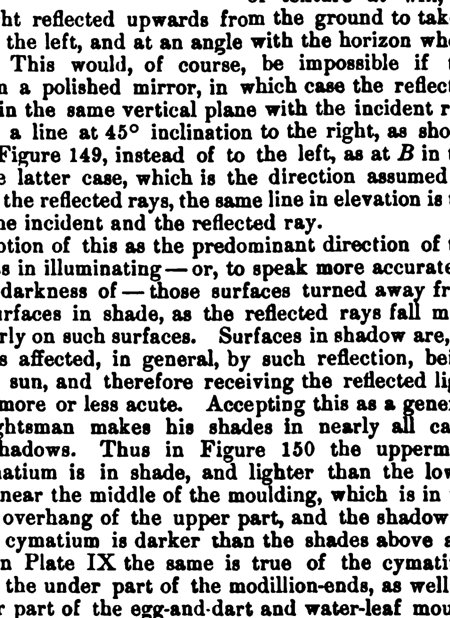


Fig. 154

NOTE. — In the title of Plate VIII in No. 877 of the *American Architect* the word Abbey should be substituted for Cathedral. The error was copied inadvertantly from Mr. Deshon's drawing in the "*Association Sketch Book*," upon which the plate in question was based.

[To be continued.]

CURIOUS ACCIDENT TO THE TORONTO WATER-WORKS. — THE PRICE OF STONE TO MASTER STONE-CUTTERS AND OTHERS.—PROPOSED MONUMENT TO MAISONNEUVE. — RELICS RELATING TO THE FOUNDATION OF MONTREAL. — SCULPTURED MEMORIALS OF SIR JOHN MACDONALD. — PAINTINGS FOR THE WORLD'S FAIR.

THE citizens of Toronto are in a bad plight as regards their water-supply. There has been trouble in this respect for many years, but it was thought that the outlay of a couple of hundred thousand dollars last year had put an end to it, and that henceforth people would have good water, without fear of its failing. But they were doomed to disappointment and further expense, and it is doubtful, even now, if the trouble is over. Water has to be brought from Lake Ontario by means of a conduit across the island that forms the southern and western sides of the Toronto Bay, and then across the bay, a mile-and-a-half wide, to a pumping-station. From thence it is pumped to a reservoir two-and-a-half miles north, at the back of the city. Until last year, the conduit was of wood, and in very bad repair, and, as the bay is the receptacle for all the sewage of the city, and bay-water found its way in considerable quantities into the conduit, and thence to the houses, it was found necessary to substitute for the wooden pipes a great steel conduit, which would also give a better supply. This was laid at a nominal cost of about one hundred and fifty thousand dollars; but there were many additional expenses, incident to quarrels with the contractor, which necessitated legal proceedings, costly delays, and other losses, without which few corporation works seem to be carried out nowadays. At the lake end of the conduit was a screen, to prevent weed and rubbish, etc. from being drawn in, and a man was employed to keep this screen clear, for fear of the weed blocking up the inlet. All went well with the pipe for some months, although there were break-downs of engines, and explosions, and so on, to vary the monotony of the engineers' lives at the pumping-house, and, in consequence of one of these entertaining incidents, the citizens have for some weeks been in danger of a water famine, although on the shore of a great lake — "Water, water everywhere, and not a drop to drink!". About Christmas Day, when probably the man at the inlet was not looking so closely after weeds as he should have been, the said weeds clogged up the whole of the mouth of the pipe against the screen; the pumps at the engine-house soon pumped the conduit dry, sections of which burst their anchorage and rose to the surface of the bay, breaking through the ice, and at the time of writing are still there, with sewage-water flowing in fast. The reservoir is so nearly empty that the engineer at the head of the water-works department has issued a notice requesting inhabitants to drink and wash as little as possible till the pipe is mended. The lengths of the conduit were joined with flexible joints, in order to allow of some play or movement, and these alone prevented entire ruin. Two joints were made solid, but at a part where there was little harm to be expected; these two joints have, of course, broken. The actual cause of the accident was, apparently, that the mouth of the pipe and the screen were of too small an area, and had the men in charge of the engines noticed that the water in the well there was gradually sinking, and stopped their engines, the pipe would not have broken. As the *Mail* says, Toronto people are *gaining experience* in water-works. They know now what a big steel pipe will do if subjected to careless treatment. Though it will be a long time before the pipe is sunk again to its proper position, the city engineer gives out that the leaks will be repaired in a few days, and that the bay-water will be kept out, so that a certain supply of lake-water will be obtained; but what would happen if there was a serious conflagration it is alarming to contemplate.

The Court-house Committee of the Toronto City Council have not reached a harbor of refuge, as they thought they had, through the piloting of their architect, who seized the works and turned out the contractor. The master stone-cutters have an association, and one of their rules is that members shall have stone supplied to them at lower rates from the quarries than other builders. Since the architect took possession of the buildings he has been carrying on the work by day-labor, intending to bring the works into a condition that they might be more easily tendered upon for completion. He found it necessary to order some Cleveland (Ohio) stone, and made a contract with a firm for the supply; but the stone came not, though expected every day. It was then found that the association was threatening to impose a fine of twenty-five cents a cubic foot upon the quarryman for having agreed to supply the stone at forty per cent less than the price that should be paid by buyers other than members. As it stands at present, the quarryman must break his contract and take the consequences, or he must pay a fine to the association of at least $500. Some of the members of the association are, however, beginning to tremble in their shoes, for it is

rumored that action will be taken against them as an illegal "combine," subject to a fine varying from one to ten thousand dollars, in which light they seem not to have regarded themselves before.

The city of Montreal is about to erect a monument to its founder, Maisonneuve (1642 A. D.), at the cost of about $24,000. A design has been adopted, but it still remains to collect two-thirds of the required sum. A ten-foot-high figure of Maisonneuve stands on a thirty-foot base. Maisonneuve stands with his left hand on his sword-hilt, and holding the standard of France in his right. At the base will be four kneeling figures, six feet high, two of which are historical characters — the one being Mademoiselle Mance in the act of bandaging a boy's wrist, the other Lambert Close and the celebrated dog Pilate, which did such good service in detecting the presence of the hostile Iroquois. Of the other two figures, one represents an Iroquois crouching in ambush, tomahawk in hand. The figure is very true to life, and is very striking in its attitude. It is, perhaps, one of the best productions of the artist, Hebert. The fourth figure is of a pioneer engaged in harvesting, his sickle in one hand, some wheat in the other, and his musket slung over his back. It was objected that this figure was too "gentlemanly" in appearance; but it seems that this was the very intention of the author, many of the pioneers having been members of noble French families, men of education and refinement. Four bas-reliefs will represent: (1) the conference between l'Abbe Oller, M. De la Douversiere, Baron de Fecamp, and Baron de Krontz, at which the foundation of Montreal was decided; (2) the celebration of the first mass on the island of Montreal; (3) the encounter on the Place d'Armes (as it now is); and (4) the death of Dollard, in the old fort at Long Sault. The arms of Montreal are designed to occupy a conspicuous position, but it has been suggested that it would be more appropriate to have the lilies of the Bourbons there instead, as being the emblem of the founders. For the benefit of those who want to take up this interesting subject, I would state that they could not do better than study Parkman's series of books on the history of Canada. Even to those not specially interested in Canada her history is interesting in the extreme, and ought to be more generally known than it is.

The last number of the *Canadian Antiquarian and Numismatic Journal* is a remarkably interesting one. It is mainly devoted to the exhibition of portraits and historical relics relating to the foundation of Montreal. It is published to commemorate the two hundred and fiftieth anniversary of that event. The paper is a good guide to the student of Canadian history, especially with regard to the old province of Quebec. An amount of information has been collected and published here which has not been set up in type before.

Photographs have reached Canada of the bust of Sir John Macdonald (the father of Canadian confederation), now set up in St. Paul's Cathedral, London, and also of the statue to his memory to be erected in Hamilton, Ontario, both the works of Mr. George Wade, of London. To people who knew Sir John well, the "views" of the bust and statue are most unsatisfactory, as an expression has been caught which they certainly do not recognize. It may be that, like the photographs of people, the particular angle of the "view" cannot be taken as a correct likeness, but when the Hamilton statue arrives, and we are able to see all round it, we may find we are very much pleased; but it is to be regretted that the work was not intrusted to some one who knew Sir John personally, rather than to one who made his acquaintance after death, through the medium of portraits and photographs.

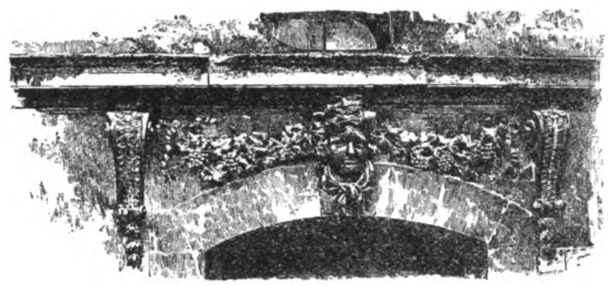
There seems to be a fatality in regard to public buildings, it is rarely that one is completed without trouble and resort to the law. In the case of the Montreal Court-house, at which extensive alterations have lately been executed, an order in council has been issued permitting the contractor to bring suit against the Provincial Government to settle the dispute as to the amount owing to him for the work. The contractor claims no less than $167,234.13 for extras and damages caused by a prolonged delay in proceeding with the work.

Preparations are being made for the next annual meeting of the Ontario Association of Architects, which is to take place in February next, according to by-law, and a large number of country members have signified their intention of being present. This convention will probably have put before it the results of the tests, made under direction of the Council, of a large number of the building stones of the country.

A competitive exhibition is shortly to be held in Montreal of the paintings of Canadian artists for the purpose of making a selection for exhibition at the Chicago World's Fair. The exhibition will no doubt be a very interesting one to the public, and perhaps not a little to the artists themselves. Hitherto there has not been held any such general exhibition of Canadian artists' work. As a rule, the pictures exhibited in Montreal are those only of members of the Royal Canadian Academy, and of course those residing in Montreal are better represented than those at a distance. But here will be an opportunity that all will endeavor to take advantage of; equally with their best works, works that have already been exhibited and criticised, and of which the authors are already aware of the general opinion. The space at the Fair in Chicago secured for the exhibition is roomy, so that a large number of pictures will probably be sent.

The exhibit of minerals in course of preparation is a very fine one, and will open the eyes of the public to the rich resources of Canada, which at present are very little known. On the whole, the Chicago Fair will probably be very beneficial to Canada, — a country occupying a position in the world of increasing importance which only needs to be better known to make it rank with the first countries of the world as regards its products. No effort will be spared to represent Canada in every particular in the very best manner, and it is probable that the Dominion will secure a large proportion of the prizes awarded.

A FRENCHMAN ON THE WORLD'S FAIR AND AMERICA.[1]



Window-head, Eighteenth Century, French. From *L'Art pour Tous.*

It only remains for me now to make some general comments on the Chicago Exhibition. That which strikes one most on arriving at Jackson Park is the entire absence of a *plan d' ensemble*. Different buildings have with one another no visible correlation and do not even seem to form parts of the same whole. Involuntarily the thought flits back to the banks of the Seine and the regularity of the plan developed in 1889 at the Trocadéro and on the Champ de Mars. It is impossible to avoid comparing these two exhibitions without finding how they symbolize the different genius of the two races. Like France herself, the French exhibition was compact, symmetrical, and built according to the majestic *ordonnance* of a general plan conceived in advance. Nearly two-thirds of the entire surface was under roof; and in the midst of an old city, which, on all sides enveloped them with its mansions, the vast metallic naves were squeezed one against the other, just as in our too narrow territory men and crops are crowded. The Exhibition of 1889, where the general views were so skilfully managed, took possession of the beholder by the majesty and symmetry of the whole more than by the finish and perfection of details. It was the work of an ancient race on ancient soil, the accomplishment of the continuous labor of succeeding generations; it was the creation of a nation having that surety and absoluteness of artistic perception which can be given only by the long traditions of a civilized past solidly compacted by the lapsing of centuries. It was, in fine, the type of a debatable ideal, but yet an ideal proceeding from certain preconceived and invariable principles; just as French society reposes upon the absolute legislative ideal, which she has, for her good or her ill, received from the Roman laws and those of the Revolution. The Exhibition of 1889 very well characterized the France of to-day: The constricted area relatively to her population, and consequently the complete utilization of her soil; the uniformity of legislation and regulating ordinances; the omnipotence of the State, as it confronts the isolated individual at the end of numberless political shocks which have violently wrenched from the old French society the social organization which attached man to man, to the field and to the workshop, and, finally, the surety and the assurance of the æsthetic idea, fruit of ancient European civilizations and refined tastes, tastes which have imbued the race with a long-reaching artistic education, and the classical traditions which came into Gaul through the basin of the Rhone from the shores of the Mediterranean.

Like the United States themselves, on the other hand, the American Exhibition is gigantic, and is not built according to a rigid and uniform general plan. On the contrary, the plan leaves so considerable a portion to each one's whim that it is hardly visible, and one would be tempted to deny the existence of any. Such as this is in our day the grand American Republic. When one travels through the different portions of the Union he forgets the flexible but strong bonds which unite them, that is to say, the Federal laws, so insignificant do these laws seem when one sees, upon the other hand, the profound material and moral divergencies which distinguish the different States of the Republic from one another. The fact is these different States are so wholly independent, so completely free, and so govern themselves, and administer their laws to their tastes, that they often have civil and political legislation entirely different the one from the other. The fact is they sometimes offer such dissimilarities in climate, products, customs, religions, and populations that one can almost say that in reality they constitute distinct nations, and, except for the question of language, have with one another hardly more resemblance than so many European nations. From certain points of view, the United States now constitute a nation of peoples rather than a united people. And just so the buildings at Jackson Park constitute a nation of exhibitions rather than a single and homogeneous exhibition. The Exhibition at Chicago

[1] Extracts from the report of the Marquis of Chasseloup-Laubat to the Société des Ingénieur Civils.

is not compact, but very much spread out. Less than one-quarter of the total surface is covered. It is not in the middle of a city that rise up the vast metallic roofs of the American palaces, but on an immense prairie, which towards the southwest is traversed by the gigantic Mississippi, and which upon the north borders the colossal lake system of the St. Lawrence, the superficial area of which is almost half that of the whole of France herself. The American soil is not encumbered with men, and one finds there, even through whole days of travel, vast spaces entirely unpeopled.

The decoration of the Exhibition buildings of 1893 is generally unfortunate enough, and one may say that it most often lacks the prime quality, style. The American architects have, in fact, copied the best-known styles of antiquity, and appear even to have forgotten the correlation, the intimate harmony which ought perforce to exist between the styles of decoration and the materials employed. They appear not to have taken into account that one cannot make a work of art by copying in brick and iron the pure contours of Greek temples which were built with blocks of white marble, nor the powerful Roman arches constructed with cement, nor the lace-work which the Arabs worked out of plaster, nor those which the masters of the Middle Ages chiselled out of granite. In 1889 the French no more sought to copy the Greeks and the Romans and the Arabs than those of their own ancestors to whom they owed their cathedrals, but they created a style, that is to say a method of decoration in harmony with the materials they used. One might say whatever one wished upon this style. One might criticise it or admire it, and think that it was very ugly or very beautiful; see in it a failure or the discovery of a new way; but one had to recognize that there existed in itself this the first of the necessary conditions which a work of art of any kind must fulfil. In 1893 the Americans limit themselves to copying the decorations of admirable monuments, which are the glory of past ages, and can only copy them badly, since they do not employ the same materials of construction which served in the creation of their models. It is all the more desirable to have to bear witness to this lack of confidence of the Americans in themselves, since they have really made some beautiful and original works in iron construction — in which certainly inheres the real beauty of the exhibition buildings at Jackson Park, a beauty of boldness, audacity, lightness, purity of lines, and a profound general harmony resulting from a perfect utilization of the materials.

Moreover, what we witness at Chicago need not astonish us: America is still too young, and the current of European immigration over the soil of the United States is too intense for the Americans to conceive, and give expression to a national art in harmony with their climate, their customs, and their building materials. The different European elements are not yet thoroughly amalgamated, especially in the West, so as to constitute human types impressed with the characteristics of their social station and the climate in which they live. The different artistic notions received from Europe are not yet, in their eyes, grouped and crystallized into a single or into several conceptions of the ideal. At Chicago one recognizes without difficulty, under the deceitful uniformity of an active American city, not only different races, but often different forms of thought. Certainly time has not yet affected its grand work of fusion between men and ideas. The Exhibition at Chicago, then, very well characterizes the United States to-day: the immensity of territory relatively to the population, and, consequently, the incomplete utilization of the soil; the difference in legislation and regulations, as well as those variations of climate and the products of different States; the weakness of the Federal State when confronted by powerful associations of workmen, capitalists and religionists, who have created the unheard-of prosperity of modern America, while attempting to produce by the human machine, solely stimulated by the energies and wills of individuals stretched to their utmost limit, a yield unheard of elsewhere; and, finally, an æsthetic taste, floating and undecided because the body of American society, still in the full fever of increase and development, has not yet had time and leisure to melt and assimilate one with the other the chaos of ethnic elements and artistic notions cast pell-mell by European emigrant-ships upon the new world, so radically different from the old Continent.

It is this retrospective comparison between the exhibitions of 1889 and 1893 which perhaps will constitute one of the most vital interests which the Exhibition at Chicago will offer. On this account, I have voluntarily abstained from saying a single word of the building constructed by the women, or, to speak more exactly, of the building constructed on the plans of a woman by men directed by a committee of women. This unusual combination, which would fill an Oriental with keenest astonishment, and would profoundly trouble all his acquired notions as to the relative rights which Allah and Mahomet in their wisdom have attributed to the two halves of the human race, has not passed unnoticed in the United States, — doubtless because the work which has resulted from it is very characteristic. The Woman's Building seems to have caused numerous and lively discussions. It has received many criticisms and eulogies. A great number of people have found it absolutely insignificant. As for me, I shall not allow myself to pass judgment on the building of the women. In fact, when one has very precise ideas on architectural art, and when one is destined to return to the United States, where, more than anywhere else, the hostility of the feeble sex is very much to be feared, it is preferable to say nothing of a work which one could not prudently criticise, although it might not be absolutely perfect. You will yourselves see the Woman's Building, will yourselves judge it, and yourselves admire it. I will confine myself for the moment to repeating to you, without comment, an epigram I heard at Jackson Park: "The Woman's Building, destined to prove to the world and America the equality of the two sexes, is a monument erected by female hands to masculine superiority." It is useless, is it not, to say that it was a man, and, what is more, an American architect, who uttered this malicious *mot*, which we will all attribute to a vile sentiment of professional jealousy.

Before finishing these rapid comments on the Exhibition at Chicago I must say a few words about the Midway Plaisance, which, as they say, will advantageously replace the Rue du Caire of the Paris Exhibition. At Jackson Park, still more than at the Champ de Mars, a considerable space has been reserved for the exploitation of the ingenuous native by more or less scrupulous tradesmen. Barnum's native country could not allow itself to be distanced by the country of Mangin, and everything tends to the belief that America will do this thing on a grander scale than we did. There has been talk of bringing thither tribes of anthropophagi, negro kings, monsters of every kind, and curiosities of all species. It seems that overtures have been made to well-known European personages, political and artistic celebrities, and even to crowned heads. Although the detailed programme of all the seductions that the Midway Plaisance will offer us does not appear to be drawn up, one can foresee that it will be very complete: multi-colored Tzigones will there produce the continuous movement of the Hungarian Csardas; small Turks will vend their acrid perfumes and rose-waters; Oriental merchants will offer the inevitable stuffs and strangely-fashioned arms (made at Paris); inventors of perpetual motion and the philosopher's stone will be there; Hindoos, Javanese, Malays, Chinese and Japanese will sell at a large profit imported krisses, teas, lacquers, bronzes, and a thousand trashy articles; and, in a word, there will be found all those self-styled exotics the beholding of which much more astonishes those who have travelled the face of our planet than those who have never quitted their homes. As you see, attractions of all kinds will not be wanting at Chicago. . . .

No description can give you an exact idea of the immense American city, built on the checkerboard pattern, covered with an immense net of wires, cut up by numbered streets, encumbered with vehicles of every kind, sprinkled with elevated railroads, which pass riotously over lofty structures of wrought-iron. How, again, picture to you the singular aspect which the houses of Chicago offer, with their sixteen, eighteen, and even twenty stories? . . .

Next, I ought to speak of the capital importance which the Exhibition at Chicago will have in the eyes of Americans, not only the eyes of the inhabitants of the United States but also those of the Canadas,— French and English,— and of all Latin America; that is to say, Mexico, Guatemala, Honduras, Nicaragua, Colombia, Venezuela, the three Guianas, Ecuador, United States of Brazil, Peru, Bolivia, Paraguay, Uruguay, the Argentine Republic and Chili. Since the exhibition takes place on the soil of the United States, amongst the most considerable, the most powerful and the richest of the young American nations, I will give you, in the first place, the opinion of North Americans on the Columbian World's Exposition. Well, the great majority of North Americans think, simply, that the Exhibition at Chicago is a marvel, or, rather, the marvel of all marvels. It believes with entire good faith that this Exhibition, the most remarkable which the United States have yet undertaken, must necessarily be, by that fact, the most remarkable which the whole world has seen since its beginning down to our days. This deserves some words of explanation. Of all the people in the world, I do not know of any one which has a higher idea of its power and force, which has more faith in its destiny and its "star," than the American people. "Our country, right or wrong"; — such is the sentiment which Americans often repeat. Such sentiments, of course very respectable, and which manifest the patriotism of the inhabitants of the United States, are deeply anchored in the hearts of the mass of the people, and are found more often amongst the workmen, the agriculturists, and the people of moderate fortune and instruction, than in the upper classes of society, that is, the intellectual *élite* of America. This is not to say that the classes privileged in the way of fortune, instruction and intelligence have a less deep love for their country than that which less-favored Americans profess; that is not at all my idea, for every inhabitant of the United States fairly believes in the future of his republic, and is justly proud of the grandeur, riches and power of his immense country, where wise laws hold together by supple yet robust bonds States whose people, as people and as individual men, are free. But these profound feelings of national pride and ardent patriotism are expressed in a very different fashion by different classes, and there necessarily results that different classes have opinions and judgments absolutely different upon foreign nations, principally as to their power, their wealth, their mode of existence — in a word, as to the civilization of European nations. The educated American — having travelled abroad, the American who has scurried through the ancient cities of Europe and Asia, who has read and thought — is not convinced that his country is in everything and for everything preferable to all others. He applauds with much satisfaction whatever at home is better understood than it is in Europe, as, for instance, the more rapid and comfortable railroads; the elevators, which move with the rapidity of projectiles, rather than move along with the slothfulness of the snail; the admirably installed public supplies of hot-water, gas, and

electricity; the universal use of telephonic communication; the systems of electric wires, which allow, without leaving one's house, the calling of the police or firemen; the metropolitan railways; the electric or cable surface-cars, which everywhere furnish means of rapid and economical movement; ventilators actuated by electricity, which give in the midst of the torrid summer heat a degree of freshness — in a word, all those most recent applications of all the sciences which have helped to produce a material civilization very advanced, infinitely more advanced than anywhere else. Besides, it is certain that in America one is more free, less hampered by regulations, the victim of fewer administrative acts, than in other countries of the globe. One feels that he has before him a grand country of vast resources still unexplored, where energetic and enterprising men can rise rapidly.

But, in opposition to all these advantages, the educated American is forced to recognize a material and moral inconvenience of the civilization and customs of his country: the immense buildings which tower up for twenty stories keep the air and light from the lower stories of other buildings; street-cleaning is almost non-existent, and streets are badly cared for; the execrable pavement is cut up in every way by the rails of surface-cars; the immense network of wire which covers the city is ugly and dangerous; the bells of the cars and locomotives maintain a deafening concert; the trains of the metropolitan elevated lines come and go all night long, producing a noise and succession of shocks comparable to those of earthquakes. The struggle for life is more ardent in America than anywhere else, and it is almost as difficult to preserve one's fortune as to make it. The daily press intrudes too often into the privacy of the family, without scruple and with entire impunity. Finally, a detail which has its importance, competent domestics are great rarities, and one is obliged to pay very dearly for their very imperfect service; and, since one dare not discharge them for fear of falling into the hands of others even less competent, one has hardly any other consolation than to take an oath that one will be even more exacting and intractable if ever the fortune of life brings about one of those brusque overturns of fortune, so frequent in the United States, and so reverses the rôles as to bring your ruined self into the service of one of your ancient domestics, who, in his turn, has suddenly become a millionnaire.

Besides, the wisest, the best educated, and the most reflecting of the citizens of the United States are not without disquietude as to the future, and they perceive on the political horizon of their country threatening clouds. They demand with anxiety whether the crowd of gross and ignorant emigrants who encumber the steerages of transatlantic vessels, and are then poured over the whole territory of the Union, are not a danger for their institutions; whether these unfortunates, who hardly know the language of the country of their adoption, and whom laws more generous than prudent convert too speedily into citizens, are capable of judging with due discernment those questions upon which they may be summoned to pass an opinion; whether the regular performance of American democracy will not be seriously compromised by the mass of votes which are cast into the ballot-box by men who seem ignorant that every right entails a corresponding duty, that liberty is not license, and that the grandeur of the United States rests solely on the respect of those liberal laws, thanks to which individual energy reaches a maximum intensity. They demand, finally, whether facts as grave as the recent strikes in Pennsylvania, during which America witnessed massacres, horrors, and the savagery of another epoch, are not indications of future graver perturbations, of a frightful war between capital and labor.

Thus the *élite* of the American nation thinks that old Europe has many good points. This *élite* knows our countries and our customs. It discerns what may be met with there that is good and bad; it knows that if America is, from many points of view, in advance of Europe, the older continent, on the other hand, offers many advantages over the new. It is too cultivated not to appreciate our superiority in the pure sciences and in the arts not to comprehend that all the gold in the world is powerless to create one of those *chefs-d'œuvre* the remembrance and worship of which survive in many perished cities, dismembered empires, dead civilizations, and forgotten religions.

But the masses of the American nation — that is to say, the great majority — have confused and unjustly prejudiced notions as to Europe. They do not know the old continent, or, what is worse, they know it badly. It could not be otherwise, since the time and means of information are lacking to them for forming equitable and precise ideas as to countries and societies so different from their own. For that matter, how many Europeans, how many Frenchmen, are there who have any misgivings that they really know what the grand American Republic is? It seems to me that the number is, unfortunately, too small, and that in the matter of complete ignorance of foreign countries our compatriots can hardly give points to many others. Now, these are the masses who are going to flock to Chicago, especially after the harvest, and who will judge the wealth, the arts and the civilization of the different peoples of the globe, not in accordance with the reality, which they cannot know, but merely after that which they will be able to see on the shores of Lake Michigan. And these are the masses who, in the United States, dispose of the majority of votes, who produce and buy most; that is to say, who possess the political and economical force. It is, then, easy to comprehend the importance of the rôle which our French section may play at Chicago by showing to the inhabitants of the United States our resources of all kinds, and by creating for us precious commercial relationships, which later may furnish outlets for those of our products in which we may be able to maintain a superiority. Besides, the French are sure of being well received in America. The old traditions of sympathy which have always existed between the two countries cannot be extinguished, and now the same form of government creates one more bond between the two republics. On this head, it is proper to refer to a fable which is sometimes heard, and which ought not to be believed. It is said that the German element, very powerful in the United States, is seeking by every possible means to do injustice to France, and that our interest at Chicago will feel its action. As for me, I believe that this is false, entirely false. It is doubtless true that there exists in the United States a German element, and this German element is powerful because it is numerous, and that it knows how to preserve in America its strong qualities of order and labor,— qualities which have made Germany one of the first nations of our epoch; but it is not true that this element can do anything at all against us. First, I do not believe that it is hostile to us, because the immigrants who compose it have for the most part been driven from their own country by misery and military servitude, and because, while preserving a remembrance of their native country, they probably have sentiments which are anything but tender for their government, which they consider, rightly or wrongly, as the prime cause of their exile. Moreover, Germans are so easily assimilated that they very rapidly lose the sentiment of their nationality; and, finally, Americans are not the people to allow certain individuals to set at naught their firm determination to live in excellent relationship with our country, and I believe that an attempt to do injustice to France would cost the authors of the attempt dearly. . . .

Finally, I will add that we have every interest to go to America, in order to study there and understand many instructive facts.

Doubtless, we have nothing to copy from the Americans in all those things which have connection with the industries supplying the luxuries, the arts and pure sciences; but how many points and interesting details shall we not assimilate in the domain of sciences applied to the industries, and in the methods of organization, exploitation and administration of grand enterprises.

But that which we ought particularly to study in America is the liberty of the individual with all its numerous consequences; the thousand forms which clothe free association; the disdain and distrust, perfectly justified, which Americans have for the modern State, whose powers and functions they intend to reduce to a minimum; the strong federations of workmen, independent because they demand nothing of public powers, nor of any one; the grand companies of which no superannuated regulations applied by tricky and untrustworthy administrations come to stop the advance and prosperity. We shall see how from the American soil, free from the Roman traditions of the omnipotence of the State, have sprung spontaneously independent associations in the face of public powers, which a wise legislation created sufficiently feeble, so that the temptation to interfere in the industrial affairs of its citizens could never be crowned with success. Over yonder, between the individual, who is stronger, and the State, which is weaker than with us, rise up, like buffers intended to deaden and localize the reverberations of social shocks, a quantity of organizations of various kinds, agricultural, commercial, industrial, scientific and religious, too powerful for the State to suppress them, and too numerous, and having interests too opposed and aims too different for them to consolidate together and usurp power. It is from the conflict between their interests and from the intense competition between them that has been created the modern prosperity of the United States, — a prosperity solely based on the fact that human labor there achieves and performs more, considerably more, than anywhere else, and because no false conception of the rôle of the public powers of modern society intervenes to hamper the free development of each man.

While with us a triple administrative machine — the State, the Department, and the Commune, complicated, slow, unyielding, brutal, costly, incapable in its very essence of ever answering the needs of the moment — too often inflicts, under the pretext of humanity, or uniformity of regulation, upon the individual energy of those whom it pretends to protect the same treatment that Procrustes compelled his victims to undergo, America is happy enough in having for the purpose of filling the different functions of the social body hardly anything more than private organizations, simple, rapid, supple, inexpensive, always ready through their very nature to respond to the complex and changing needs of industry, custom and ideas. These free associations have, then, created the wealth and prosperity of the United States, but they have done far more: They have created a nation, a type of society, the only type of future society in fact which can be supple enough to easily accommodate itself to the extreme instability of modern democratic government: they have created the American with his audacity, with his energy, and his determination; and since the wealth, energy and the moral forces of the nation are only the working capital, are only the intregal forces of wealth and energy and moral forces of all the individuals of that nation, we ought to carefully study these American associations, in order to find amongst them, through the magnificent results which they have already achieved — and not in the enervating and deceitful reveries of State socialism — the future ways of material and moral progress for humanity and for civilization.

A CENTURY OF FRENCH ART AND EDUCATION.[1]

Miserere in Choir of Amiens Cathedral. From *L'Art pour Tous.*

THE exhibition [Paris, 1889], in celebrating the great upheaval of a hundred years previous, both gained strength and lost it. Whether in the sphere of art or in that of education generally the revolutionary epoch offers us a series of picturesque incidents and movements which rivet the reader's attention to a degree which the results achieved perhaps hardly justify. How strangely mixed the ingredients which went to the making of that great bubbling, seething *pot-au-feu*, the French Revolution! an enlightenment which threw open the *Salon* to all comers, French or foreign, as was done in 1791; a bigoted wrong-headedness which called for a holocaust of all the works by artists who had left the country as a sacrifice to the shades of dead patriots! How absurd, yet how nearly bordering on reason, the creation by David of the *Salon* jury, to the composition of which went not only artists, or, perhaps I should say, not only philosophers, poets, mathematicians, men of science, but a tailor or a bootmaker and an artist or two! What unmixed wisdom, on the other hand, that which prompted the dedication of the Louvre as a public gallery and the inauguration of departmental museums, which date from the same year! When discontent against the institution at Burlington House, because of the want of room for outsiders and the greediness of the members, is in the air, it is well to remember that although, on the throwing open of the *Salon*, the number of pictures exhibited jumped at once from 794 to 1,791, and in the next year to 2,000, not a trace of new talent was discoverable. It went only to prove, what ought never to be forgotten, that talent will make its own opportunities. The central figure of this period was David; indeed, for forty years he ruled his fellow-artists like a dictator; always classical in his leanings, he gradually deserted Rome for Greece as the source of his inspirations, for, as he said, Rome would have been barbarous without Greece. Like most reformers with a real foundation of good sense, he soon found himself left behind, and the school of Primitives, who burned to destroy every work of art subsequent to the time of Phidias, did not scruple to label him "Rococo." It is impossible to follow the "Century of French Art" in detail. Ingres succeeded to David as the champion of the Classicists, while the Romanticists ranged themselves under Delacroix. Corot, Rousseau and Daubigny, who first made Barbizon historical, belong, as it seems, almost to our own day. Later still come Millet and Breton, and then we are face to face with Regnault and his contemporaries. Such a roll of names as the French painting and sculpture of the period present is to be matched nowhere else.

The same period saw the building of the Panthéon, the Madeleine and, later, Ste. Clotilde; while among sculptors, as among painters, the classical feeling, which at one time was so strong, or at least so much in the mode, was gradually exchanged for a manner which inclines to sensuousness, and is sometimes too clever to be statuesque.

Of the long survey of education it is impossible to give even the barest outline. Marcus Aurelius, Charlemagne, Remi of Reims, who opened the first public school in Paris in 908 — these are the names most closely associated with the establishment of educational machinery in France during the first ten centuries of the Christian era, and, from the time of the last-named teaching, may be said to have become not only a recognized career, but even a stepping-stone, as in the cases of Adrian IV, Innocent III, and others, from the most humble to the highest place. From the earliest days the rhetoricians had found a fertile soil in the acute intellects of the people of Gaul. Their forensic abilities, their love for the subtleties of argument, soon showed themselves, and we find that the actual creation of the other faculties in the University of Paris was mainly due to the exaggerated addiction to argument which marked the theological professors appointed by the Pope, and a general desire for some means of suppressing them. This antagonism was no passing feeling, and resulted in a gradual estrangement of the University from the Pope, till at the beginning of the fourteenth century it was in close touch with the civil authorities.

The setting-up of the first printing-press in France, in 1470, was the beginning of a new order of things; mental gymnastics, wild and often childish speculations, gave way to a better-regulated system of study, the formation of a more compact body of established knowledge, and the growth of a more scientific attitude of mind. It was no longer the day of an Abélard confronting the deepest controversies with airy audacity. Erasmus epitomized the new spirit of the age when he said: "When I have money, I shall buy Greeks books first, and clothes afterwards"; and Montaigne first gave the real formula of education when he described it as the "bringing-up of men so that they *can* do anything, but choose only to do what is good."

I pass over the days of the Reformation, dark ones for the general cause of education, however warmly Luther himself was inclined to promote it, because the attention of the world of learning was devoted almost exclusively to theological studies; and I pass over the days of Jesuit dominion, constantly broken and as often rearing its head again, when the aim was less to turn out thinkers, than Christians with a sufficient appearance of education to be deceptive. In 1762 appeared Rousseau's "*Emile*," and the secularisation of education became the universal cry. With the Revolution came a whole crop of vast projects based on sound reason in many respects and prophetic of much that is familiar to us now, but involving changes so fundamental that, at the moment, they led to little or nothing.

Boissy d'Anglas in 1792 urged the general teaching of design. "It is the school," said Representative Portiez, "in which are formed, directly or indirectly, all the industrial arts." Talleyrand asks the National Assembly for free education for all — in the first degree; Condorcet makes an almost similar appeal to the Legislative Assembly — free education up to such a point as should secure every man his independence. The Convention throws it all aside, and prefers to train up the youth of the country to be not only independent, but, above everything, citizens of a republic. Meantime, while reports are being printed, and projects growing larger, public instruction is almost at a standstill, and the retrograde step of allowing liberty to individual effort is given under compulsion. In vain the "Directoire" threw every obstacle in the way of private schools, which were regarded as hot-beds of Royalism. They only flourished the more.

The First Empire need not detain us; Napoleon did indeed found an imperial university in Paris, but, on the other hand, he denuded half the universities of Europe of their students. MM. Victor Cousin, Guizot, and Duruy fill the interval till the war of 1870, but it wanted that stimulus to make the spread of enlightenment other than tedious. The result of the war pointed to an obvious rottenness somewhere, and the friends of education had the whole people at their back when they demanded that the general level of intelligence should be raised. Public attention was turned by M. Jules Simon to the necessity for a greater development of physical powers, history, geography, and modern languages were given a larger space in the field of secondary education. The leading idea, indeed, was to provide remedies for the special weaknesses which the war had brought out. It remained for M. Jules Ferry to accomplish what Jules Simon, and Duruy before him, had desired, and in 1881 primary education was made free, and shortly afterwards obligatory; while a few years later public instruction was put exclusively into the hands of laymen. The tendency in France, in the higher education, just as it is in England, is to the so-called "modern side," and to general culture rather than to a high degree of proficiency in special subjects. Meantime two principles have been evolved, which have what would seem a lasting foundation in their justice and reasonableness: First, the duty of the State to teach; and, secondly, the right of the individual to exercise the same function. — *The R. I. B. A. Journal.*

[1] From a review by Mr. A. E. Street of the "*Exposition Universelle internationale*, 1889, *Paris, Rapport général*," par M. Alford Picard.

SOCIETIES

SOUTHERN CHAPTER OF THE AMERICAN INSTITUTE OF ARCHITECTS.

AT the Second Annual Convention of the Southern Chapter of the American Institute of Architects, held at Birmingham, Ala., January 10, the following officers were elected for the ensuing year: *President*, Mr. L. F. Goodrich, Augusta, Ga.; *Vice-President*, Mr. E. G. Lind, Atlanta, Ga.; *Secretary*, Mr. W. P. Tinsley, Lynchburg, Va. The following Board of Directors was elected: D. B. Woodruff, Macon, Ga.; T. H. Morgan, Atlanta Ga.; C. C. Burke, Memphis, Tenn.; Tom Wood, Sherman, Tex.; T. H. Maddox, Birmingham, Ala.

THE ILLUSTRATIONS

[Contributors are requested to send with their drawings full and adequate descriptions of the buildings, including a statement of cost.]

HOUSE OF DR. HENRY HOOPER, NORTH STATE ST., CHICAGO, ILL. MESSRS. BURLING & WHITEHOUSE, ARCHITECTS, CHICAGO, ILL.

[Helio-chrome, issued with the International and Imperial Editions only.]

ARCHITECTURAL SHADES AND SHADOWS: PLATE IX.

FOR description, see article elsewhere in this issue.

CENTRAL BUILDING, KINDERGARTEN FOR THE BLIND, JAMAICA PLAIN, MASS. MR. WALTER R. FORBUSH, ARCHITECT, BOSTON, MASS.

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HOUSE DESIGNED BY MR. SAMUEL MILLIGAN, ARCHITECT, PHILADELPHIA, PA.

[Additional Illustrations in the International Edition.]

THE ANCIENT CATHEDRAL OF CAMBRAI (NORD), FRANCE.

Thanks to the labors of an architect, M. Peinte, lately deceased, we are able to furnish, in connection with the plate we copy from *La Construction Moderne*, the following facts concerning the ancient Cathedral at Cambrai:

M. Peinte, who for sixty-five years practised his profession in Cambrai, devoted himself to determining the sites of the cathedral, the episcopal palace, and the other dependences which surrounded the main entrance to the cathedral. His son, also an architect, settled at Paris, has furnished the graphic and archæological data for this study.

In his history of the cathedral M. J. Houdoy says: "Succeeding conflagrations destroyed the primitive church of Cambrai, the foundation of which dated back to the fourth century. Rebuilt by Saint Waast in the sixth century, and by Bishop Gérard II in the eleventh, on a larger scale, it was partly consumed by the conflagration of 1148, which destroyed all that quarter of Cambrai called 'Le Château,' in which was included the cathedral, the episcopal palace, and the abbey of St. Aubert. Nicolas de Chièvres was at that time the bishop; he undertook the reconstruction of the cathedral on a new plan, and to this work he consecrated not only the revenues of the church itself, already wealthy by reason of gifts from emperors, kings and princes, but to it he devoted also his personal fortune. Thirteen years after the disaster I have just mentioned, the church, or at least an important part of it, was raised upon the ruins of the old building; the nave and transepts were rebuilt or repaired, as well as the steeple, which was rebuilt upon the eleventh-century stone tower, the interior of which had been spared by the fire. . . . At the end of the twelfth century the Romanesque portion of the building was finished, and this included the main entrance, flanked by two projecting turrets, which rose to about the height of the platform, from which started the octagonal stone spire, then recently rebuilt, and which, at a height of one hundred and seven metres, supported the bronze angel which crowned its apex; also the nave and the aisles, in one of which the chapel of St. Gengulphe had been included; and, further, the transepts, with their ends rounded, as is the case with those of the cathedrals at Tournai and Noyon. As for the choir, it was not built at this epoch, and this was the reason why, in 1167, Bishop Nicolas was buried beneath the tower, which was his own work."

The building of the choir was begun during the rule of Bishop Godefroi de Fontaines (1220–37). This portion is ascribed to Villard de Honnecourt, an architect who had already built the Abbey de Vaucelles. On the completion of the choir, the Cathedral of Cambrai had a total length of about one hundred and twenty-eight metres.

Popular rumor mentions a remarkable clock, which is in fact frequently referred to in the local annals. For instance, the account-book for 1318 itemizes the salary paid to the mechanician in charge of this apparatus, which was placed in the north transept surmounting the Chapel of Notre-Dame-de-Pitié, or du Sépulcre.

In 1796, the cathedral, being public property, was sold to undergo demolition. M. Alexander Lenoir, who in 1806 visited the ruins, made to the Société Celtique a report upon the main porch and the tower surmounting it, which at that date was standing. On January 30, 1809, however, this tower was overthrown by a tempest.

At this time an accurate plan of the cathedral ruins was prepared by M. Boileux, architect to the city, and his reconstruction of the plan of the choir conforms exactly with the plan which was found later in one of the note-books of Villard de Honnecourt, the celebrated thirteenth-century architect.

The numbers upon the plan may be interpreted as follows:

(1) Porch; (2) Tower; (3, 4, 5, 6, 7) Chapels; (8) Sacristy; (9, 10, 11, 12, 13, 14, 15) Chapels; (16) Entrance; (17, 18) Transept Doorways; (19) Triforium; (20–28) Chapels; (29) Entrance from Episcopal Palace; (30) Porch; (31) Gallery; (32, 33) Entrances; (34) Gallery; (35) Entrance; (36) Ante-chamber; (37) Chapter-house; (38) Court-yards; (39) Court-yard of the Episcopal Palace.

DOME OF THE CATHEDRAL, MARSEILLES, FRANCE. M. VAUDOYER, ARCHITECT.

This plate is copied from *La Semaine des Constructeurs*.

STAIRCASE, SCHLOSS MIRABELL, SALZBURG.

This plate is copied from *Architektonische Rundschau*.

ST. PAUL'S CATHEDRAL, CALCUTTA.

The Anglican Cathedral Church of Calcutta, an illustration of which is to-day copied from *Indian Engineering*, though not faultless either in its planning, its construction, or its details, is, nevertheless, the most conspicuous ecclesiastical edifice in the city. It occupies a prominent and appropriate position in the southeast corner of the open space known as the *Maidan*, and its graceful steeple soars higher than any other structure in Calcutta.

Its erection was due to the untiring efforts of Bishop Wilson, who himself contributed most handsomely to both the building and endowment funds. The foundation-stone was laid in 1839, and the church was consecrated eight years later, the designs having been prepared by Major Forbes, of the Bengal Engineers, to whose memory a marble tablet was subsequently placed in the church. The cost was about five lakhs of rupees.

The design of the building is in the Gothic style, treated in a manner that may fairly justify our calling it by the not inappropriate name of Indo-Gothic. Fergusson, in his "*History of Modern Architecture*," freely criticises this specimen of Anglo-Indian architecture, remarking that the architect and bishop "produced between them a building in a style such as has not been seen in this country since the Peace of Paris."

In plan the cathedral consists of a large square hall without aisles, transepts, or separate chancel, properly so called, such as one is accustomed to see in the larger churches,— rather conspicuous defects. At the west end is a large porch with the library over it, and the tower with steeple rises through the roof between the porch and the nave. The space below the tower forms a sort of crossing, there being north and south transverse blocks forming entrances to the church and leading to the two vestries which are placed west of these blocks.

The phase of Gothic employed is that known as "Perpendicular," but the leading features are feeble and ill-placed. Fergusson is not less severe in his criticism of the details than of the structure as a whole. He says: "We have done strange things in this country, but nothing quite so bad as that. It entirely fails as a Gothic representation. The worst feature, however, is that of being entirely unsuited to the climate, having neither verandas for shade nor proper windows for ventilation; nor do its arrangements satisfy any of the requirements of the ecclesiologist of the present day." This is sweeping condemnation, but is no doubt given in a fair spirit of criticism, and the fact that the English Cathedral in the capital of our Eastern Empire has so many shortcomings, and is not to be compared with any of the larger churches in England, ought to cause a pang to the large body of Christians of the Established Church whose ways are cast in India.

The extreme length of the building is 247 feet and its width 81, and at the transepts 114. The height of the tower and spire from the ground is 201 feet, and of the walls to the top of the battlements 59 feet. There is a grand enclosed veranda or porch to the west, 61 feet by 21 feet, over which is the library. The vestibule is 36 feet by 22 feet 8 inches. The lantern beneath the tower is 27 feet square, and opens by lofty arches to the transepts.

The dimensions of the main body of the cathedral are 127 feet by 61 feet, and it is spanned by an iron-trussed roof adorned with Gothic tracery. The interior fittings are handsomely carved. The east window was the gift of the Dean and Chapter of Windsor. The subject is "the Crucifixion," after a design by West. The communion plate was the gift of Her Majesty the Queen. The building was consecrated on October 8, 1847.

ALL SAINTS' CHURCH, HERTFORD.

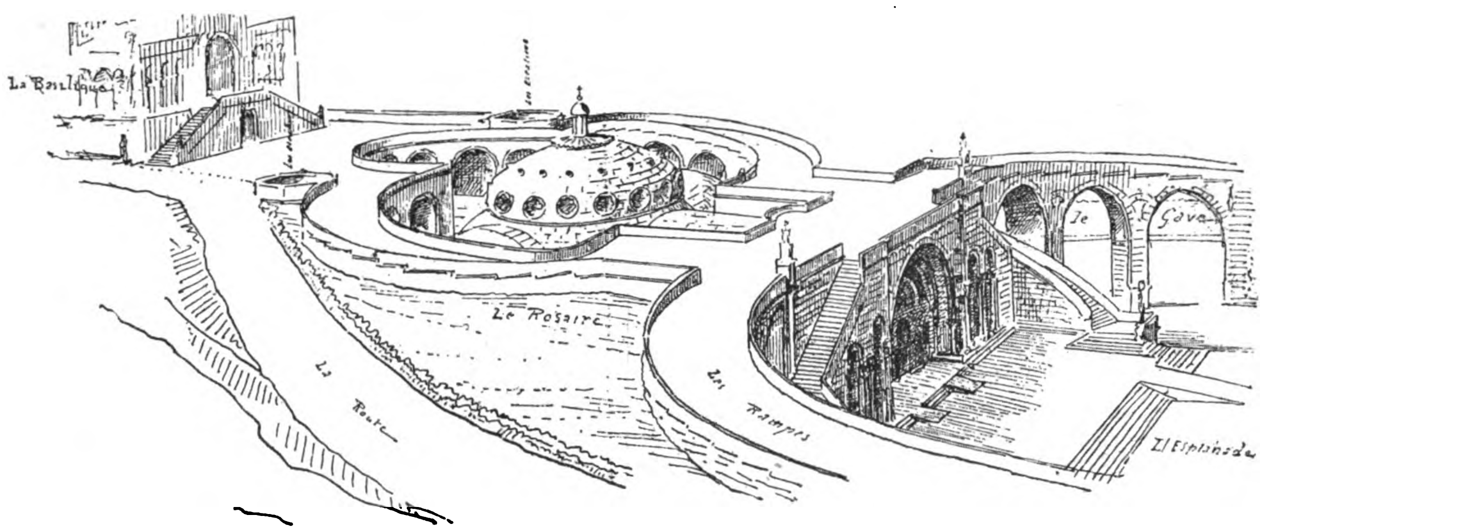
We copy from *Building News* a general perspective view of the new Church of All Saints, Hertford, from the drawing by the architects, Messrs. Paley, Austin & Paley, of Lancaster. The style of the church is Perpendicular, and, in plan, consists of a nave of five bays, 73 feet long by 26 feet 6 inches wide, with western tower about 26 feet square, and north and south aisles 20 feet and 18 feet wide respectively, with aisles opening into the tower, in which is placed the font. The north porch is hexagonal, so that its entrance may be more convenient as regards the pathway. There is also a western entrance through the tower. The chancel is a continuation of the nave, and is 42 feet long. There will be no chancel arch, as in the old church and in other instances in Hertfordshire. There will be a spacious south chancel aisle, with separate entrance and porch, and on the north side of the chancel a lofty organ transept with two arches opening into the north aisle. There are also clergy and choir vestries on the north of the chancel. The new church will cost at least £15,000. A limited number of well-known church architects were invited to send to the committee drawings and photographs of their executed works, and by these a choice was made of the architects, who thereupon received the commission.

NEW PREMISES, CHELSEA. MR. F. G. KNIGHT, ARCHITECT.

This illustration, copied from the Jubilee issue of the *Builder*, shows some new business premises, with residential apartments for assistants above. The buildings are now in course of erection in Sloane Square for Mr. D. H. Davies. The materials used for the front are light-red bricks from the Laverstock & Acorn Company, and terra-cotta dressings and enrichments, with Westmoreland green slates on the roof.

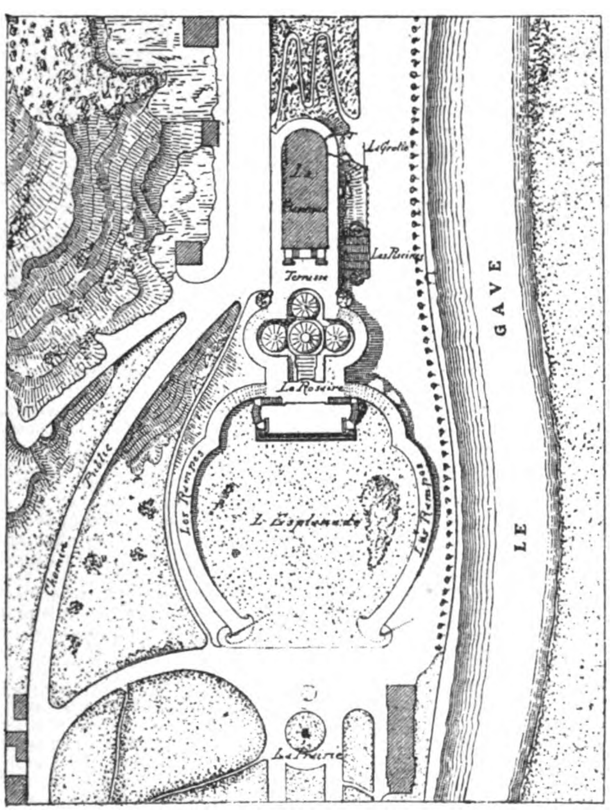
THE CHURCH OF THE ROSARY, LOURDES, FRANCE. M. HARDY ARCHITECT.

TWENTY-FIVE years ago, in consequence of the miracles said to have been performed at Lourdes, a church was built on the cliff which overhangs this celebrated grotto, under the direction of the late M. Durand, diocesan of Tarbes. This building, now called "the basilica," is not of great size, and consists of merely a nave with lateral chapels, while a crypt has been provided under the choir and chapels. As this building has now become too small for the accommodation of the many pilgrims to this famous shrine, it has been necessary to build a new church. Besides, it was very desirable that the processions, which form the characteristic feature of the devotions, should take place elswhere than over the public roads.



Church of the Rosary, Bird's-eye View.

The basilica is built on a cliff nineteen metres above the Gave, which flows at its foot. The cliff and hillside extending northeastwardly, it seemed to be difficult to find a proper site for this new building; so, on the suggestion of the architect, it was decided to excavate the cliff to the foot of the basilica and let the *rampes* ascend from the plain to the head of the basilica, passing above the new church as they did so, although the work would be of considerable magnitude, involving the removal of ten thousand cubic metres of stone.



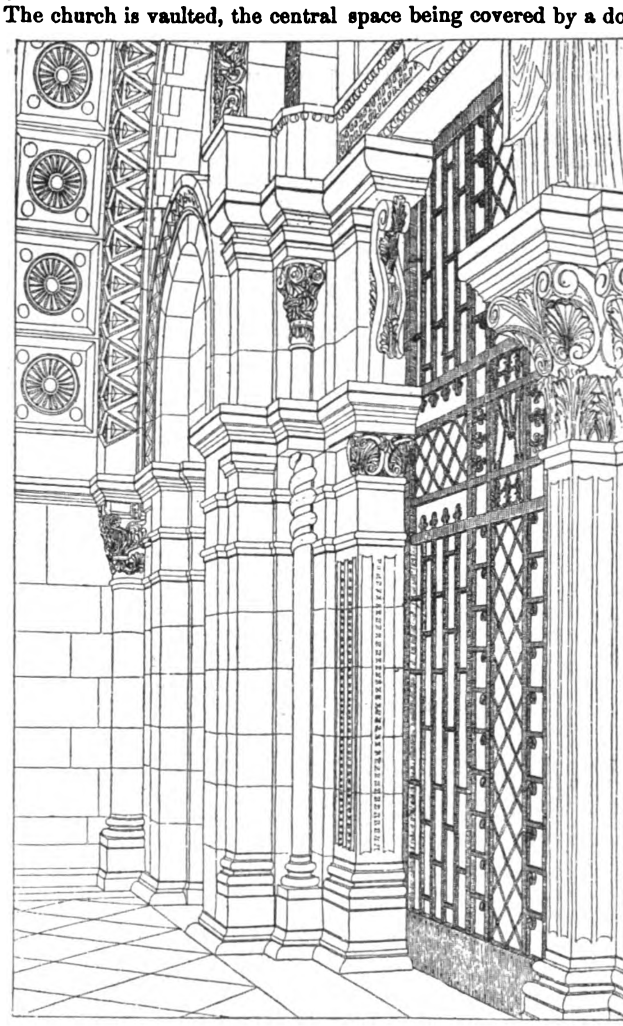
Ground Plan.

The prime condition was to meet the urgent requirements of the situation without injuring the basilica. The last part of this condition seems almost superfluous, since a true artist will not do wrong to the work of his predecessor.

The new church was erected in the name of the Rosary and this nomination determined the form of the plan. Work was begun in 1883 and all the important portions except the spires were finished in 1889.

The plan of the church itself is a Greek cross, each arm of the cross containing five chapels, consecrated, the five in the south transept to the Joyous Mysteries, the five in the choir arm to the Sorrowful Mysteries, and the five in the north transept to the Glorious Mysteries. The south and west sides backing against the hillside not affording a chance for windows, light had to be admitted from above.

The church is vaulted, the central space being covered by a dome on pendentives. This is pierced with thirty-two bull's-eye windows, while the eye of the dome, like the others, still waits for its furnishing of stained-glass. Each chapel is lighted through windows that take their light from under the arcades which support the *rampes.*



Detail of the Porch.

These *rampes* ascend with a grade of 0m.10 per metre, and in their construction all steps and stairs have been omitted, to avoid accident during nocturnal processions. Starting from a level, the one bordering the river is supported upon solid arcades, while the other rests upon arched niches dug in the cliff itself. The first runs end in a wide landing just over the nave of the new Church of the Rosary, and from this level they continue with a grade of 0m.11 or 0m.12 per metre, getting their support on the piers of the chapels below. Two spiral staircases, at right and left, provide means of descending from the level of the basilica to the new church and to the *quai du Gave*. These staircases are ultimately to be crowned with stone spires and connected with the basilica by cloisters or porticos, the façades of the basilica being widened by the addition of two towers.

The church is built of a very hard grayish marble obtained from the local quarries, so hard that the workmen have to use hammer and chisel with great care. In consideration of this hardness of the material, and considering also the rude aspect of the surroundings, it was thought best to build the *rampes* with rock-faced stone, dressing only the more important parts.

The interior of the church was lined with a white stone, not only for economical reasons but also because the native stone used for the exterior was, curiously enough, in spite of its hardness, of a very hygroscopic nature.

Half of the church is founded on the living rock of the cliff, while for the other portions foundations had to be sought in the ancient bed of the Gave under water. These foundations had to be carried five metres below low-water mark. Between the layer of concrete which finishes the foundation and the level of the church floor above a large resevoir has been contrived, in which, during the winter, will be collected the precious water that flows from the grotto.

Between the two *rampes* is enclosed a broad esplanade on which can be gathered as many as three thousand pilgrims. Here on solemn occasions will be set up a portable altar just in front of the great entrance, the steps of the church serving as the choir, and the spiral staircases on either hand as ambos.

This description and the accompanying illustrations are copied from *L'Architecture*.

ST. PAUL'S CATHEDRAL: SOUTH SIDE OF CHOIR STALLS.

ST. PAUL'S CATHEDRAL: DETAILS FROM CHOIR STALLS.

A FLEMISH MAISON COMMUNALE. MR. W. C. BRANGWYN, ARCHITECT.

THIS building has been erected at Cruybeke, near Antwerp. The walling is in red brick, with white stone dressings and green slate roofs. On the ground-floor are the offices of the "Bureau de bienfaisance," entrance-hall, etc., and on the first floor the council-chamber and secretary's office. At the rear are lodgings for the care-taker. The work was obtained in competition with several Belgian architects.

OFFICES, LAWRENCE LANE, LONDON, E. C., ENG. MR. HERBERT E. KNIGHT, ARCHITECT.

THIS building, covering an area of over 2,000 feet superficial, with a limited frontage, is being erected in the present-day luxuriously fitted manner, the whole of the office-fittings being in English oak, the external front being in Portland stone and glazed brick. Like all first-class modern offices, the electric-light is being adopted.

SANDHILL SCHOOL, LAUNCESTON, TASMANIA. MR. ALAN C. WALKER, ARCHITECT.

THIS building is being erected from the designs to which was awarded the first premium in open competition. The working-drawings were prepared by the Public Works Department of Tasmania.

DESIGN FOR VILLAS, MOUNT MARTHA ESTATE.

NOTES AND CLIPPINGS

INTELLIGENCE AS IT USED TO BE IN HOLLAND — A correspondent says that the good citizens of Kempen, in Holland, where Thomas à Kempis was born, do some droll things. At one time a fire broke out, and much damage was done because the engines were out of repair. The Council met, and after much argument it was voted that on the eve preceding every fire the town officers should carefully examine the engines, pumps, etc. One of the greatest profits of the town was the toll exacted at the gates. The Council wished to increase the income, and instead of increasing the toll it voted to double the number of gates. This same Council also ordered the sun-dial to be taken from the court-house common and placed under cover, where it would be protected from the weather. But of all the queer things that are told of Kempen and its people nothing is so absurd as this: Grass grew on the top of a very high tower, and the only way these droll Dutchmen could think of to get it off was to hoist a cow up and let her eat it. — *N. Y. Tribune.*

THE COST OF A BILLIARD BALL. — The cost of a billiard ball is curiously estimated by a Cairo author as follows: In the judgment of honest African travellers, the tusks of dazzling whiteness are answerable for the following: 160 deaths that must be counted as murder or manslaughter; thirty deaths, incurred during the journey from the interior to the coast; ten "deaths by law," and ten accidents during the elephant hunt. "Add to this fifteen thefts, any amount of cheating, drunkenness, and acts of brutality and cruelty." A medium-sized faultless tusk yields two, or occasionally three, billiard balls; and every ball means, it is stated, at least one murder or one great crime. — *Invention.*

ALUMINIUM FOUR CENTS PER POUND. — Dr. Meyer, of Berlin, claims to have discovered a process by means of which aluminium can be produced at 2*d.* per pound. In 1830 the value was £1,000 per pound. The price to-day is 4*s.* per pound. There is said to be ten times more aluminium in the world than there is of iron, lead, copper, zinc, nickel, gold, and silver combined. It is stronger than iron, and more malleable than copper, as hard as silver and one-fourth the weight, as white as polished steel, and it is unaffected by the atomsphere. — *Invention.*

TRADE SURVEYS

THE abundant statistical information and voluminous reports that have been published since the opening of the year go very far to strengthen and fortify the conclusions drawn late in the old year concerning the probable characteristics of 1893. The strong point is that stocks are low. The weak point is that prices are abnormally low — so low as to check production beyond really safe limits. The duration of this depression will cause exhaustion of stocks. Cold weather has, of course, obstructed deliveries of some of the heavier materials, but the weekly figures of railroad traffic show very little, if any, diminution in general merchandise shipments. The returns of one hundred and twenty-five railroad companies' reporting for eleven months show heavy gains in gross earnings and moderate gains in net earnings. Probabilities as to railroad earnings in the near future are very favorable for the maintenance of the increase observed during the past year. Another point deserving notice is the wonderful development of traffic on new short lines constructed during the past two or three years, which is shown in railroad-company and State reports. Small towns and small industrial centres are growing rapidly, and traffic resources are developing most satisfactorily. As to new railroad construction, the latest reliable information is that three or four large rail orders have been placed; that construction will begin early in the spring on about two thousand miles of new road; that equipment and rolling stock will be ordered very largely during the next two months, and that a perceptible improvement will result to general business from this source. Careful inquiries made of car-builders prove that the reported activity is true, and that a large amount of new work will be placed soon. It is also definitely ascertained that the requirement for all manner of equipments — railroad, electrical, mechanical — will be unusually large. A leading authority in matters relating to equipment supplies says there is an unusual degree of activity at this time in taking out old and putting in new machinery, in enlarging capacity, in reorganizing industries, and so on, the outcome of which will be greater activity in the numberless little and big shops and factories turning out those things which may come under the name of equipments. A common reply to business managers of trade and class journals is: "We have too much to do to advertise for more business" — a correct statement in a great many instances. The fact is, no less than a dozen States are being made over into industrial States, if the term will answer to explain the great expansion of capital in industries, and its relative increase as to agricultural capital. It is the demand from this source that is making work so abundant in the Eastern industrial centres. But this statement demands modification. In certain channels dulness prevails; but this is due to the accident of enlarged capacity in these special lines. There is so much that is new in all kinds of machinery that those who stand still long enough to rest find themselves distanced by competitors. In the financial world, the ordinary channels are well supplied with money at low interest rates. The realization of the fact that the exportation of gold is due to special causes having their origin in European necessities, real or imaginary, has done something towards relieving the public mind on that score. The contentions of the hostile camps on proposed silver legislation have simmered down to a question of votes. No comprehensive or acceptable plan for a national currency has been presented, though half a score of measures to that end have been formulated. The continued ease in the money markets is exerting a favorable influence on general trade, though it is too soon to move forward. New York jobbers said, last week, they anticipated a heavier trade than for years. Boston jobbing interests, though not so outspoken, have confidence in a year of heavy trade, and at improved margins. The bank clearings are very encouraging, and the fact that the country it not burdened with stocks gives a tone to the market that means steady prices for months to come. The iron and steel trades are quiet. The Western manufacturers contemplate a contest with their skilled workmen next summer, and it is probable an attempt will be made to "non-unionize" the iron and steel mills of the entire West. In the meantime, some preparations will be made for a long suspension by the piling up of stocks. In lumber, strong prices rule; in paper-making, restriction continues; in coal-mining, great activity prevails, except where operations are impeded. In textile mills, orders are crowding production. The policy that manufacturers follow is to keep in sight of the market requirements. The projecting of new work is seen on every hand, despite the modest encouragement given. Promoters and investors argue that an era of higher, if not high, prices is a probability within the next year or two, and they feel it is safe to build and enlarge on low prices. The evil of long credits is being slowly overtaken. This is more due to the stronger commercial health than to any specific efforts of the traders. With all conditions favorable, with low prices, declining mortgage indebtedness, and a fair volume of good money, there are no reasons for anticipating adversity or depression. Another good building year is promised. The enterprise displayed last year was wise, and has been fairly rewarded. Material is lower in price, and manufacturers are soliciting yearly contracts on the basis of last season's figures.

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CONTENTS

Summary: —

The Resignation of Mr. Adler and the Appointment of Mr. Stone as Secretary A. I. A. — The Suggested Appointment of a Layman as Assistant-Secretary. — The Work an "Architectural Bishop" might do. — The Question of a New City-hall for New York. — The Method proposed for the Foundations of the Manhattan Life Insurance Company's Offices. — Some Difficulties attending its Use. — Changes in German Spelling. 65

The Ile-de-France School of Architecture. — III. 67

Construction. — XIX. 68

Letter from Chicago. 71

Ventilation. 73

An Architect's Home. 74

Burned Clay as Roofing Material. 75

Societies. 77

Illustrations: —

Old Houses, Front Street, Harrisburg, Pa. — The Newton Club-house, Newton, Mass. — Competitive Design for the Newton Club-house, Newton, Mass. — House at Dorchester, Mass.

Additional: Fountain at Fontenay-le-Comte, France: Three Plates. — The Imperial Institute, South Kensington, Eng. — Detail of the Same. — The History of Joan of Arc. . . . 77

Communications: —

The League Exhibition. — Size of the Paris Hôtel de Ville. . 79

Notes and Clippings. 79

Trade Surveys. 80

WE have just received notice that Mr. Dankmar Adler, who since the death of Mr. Root has occupied acceptably the chair of the Secretary of the American Institute of Architects, has found himself obliged, by the pressure of his private practice, to resign that office. In his place the Directors have elected, as Secretary of the Institute, Mr. Alfred Stone, of Providence, R. I., who has long been a member of that body, — one might say almost the only active member, since there can have been but few meetings or conventions at which he has not been present and taken an active part in the proceedings and discussions, while the attendance of other individuals has been sporadic, and their attempts to influence action only of intermittent character. While thus taking a leading part in the councils of the body, he has never in the slightest degree subjected himself to the imputation of seeking to "run things," and it has almost always been found that when his plain common-sense arguments had been heeded the Institute discovered that events proved it was proceeding in the most judicious manner possible. Perhaps the fact that Mr. Stone has two partners, whereas Mr. Adler has but one, may enable him to give to the Institute's affairs the time and attention they demand, without being forced to sacrifice too much of his own private interests.

THERE has been a good deal of discussion among the members of the American Institute of Architects about a proposition, which is said to have been made, to have a Secretary of the Institute appointed by the Board of Directors, who need not be a member of the profession, but shall devote himself entirely to the service of the Institute. It has even been reported that a candidate had already been selected, in the person of Mr. McLean, the managing editor of the *Inland Architect*, who has been very closely connected with the Institute affairs for some years, and probably knows more about them than any one not in the ranks of the profession. As Mr. McLean writes us that he would not think of accepting such a position, even if it were offered him, we suppose that the rumor is unfounded, and, indeed, we should be sorry to see Mr. McLean retire from the control of the charming professional journal which he has directed with so much ability and taste. As to the main question, whether it is advisable to take a Secretary for the Institute from outside the profession, while, like Lincoln, we prefer not to jump our fences until we come to them, it may not be amiss to suggest that the Constitution of the Institute would have to be amended before a Secretary who was not a practising architect could legally exercise the duties of the office. The By-Laws permit the Secretary, with the approval of the Board of Directors, to employ such clerical help as he may require, and it would seem as if this provision ought to make it quite practicable to keep in the responsible position of Secretary an architect of the highest rank in the profession. If it should be found that men in the most active practice could not be induced to undertake even the duty of directing clerks and signing papers, there are several architects whom we could name, members of the Institute, thoroughly accomplished and experienced in professional life, who, through various circumstances, prefer the quiet satisfaction of a moderate business to the excitement of battling for employment in the crowd of "hustlers." Among these, the very best secretaries, cool and experienced, with time enough to spare for thoughtful courtesy, would be found, and, until the supply of such men is exhausted, there will be no need of going outside the profession for officers of the Institute.

IT has been suggested that a lay Secretary, whose time was entirely at the disposal of the Institute, could be set at work travelling over the country, organizing Chapters, and looking after professional interests. There is certainly something in this suggestion. It has often occurred to us that a sort of architectural bishop, who would go from Chapter to Chapter, observing the condition of the faithful, and animating their zeal by an encouraging word here, or, perhaps, an admonition there, might be a very useful personage; but we imagine that, in church affairs, a lay bishop would meet with more derision than reverence, and an amateur would hardly have better success in dealing with associations of architects; and, as it would be useless to expect any busy architect to give up his office and take to pastoral visitations, the same end must be brought about in some other way. This, we think, is quite possible. In the first place, many questions which are now decided by the Board of Directors might be submitted to the Fellows. Of course, they are decided judiciously, but it would interest the members to be allowed to say something, from time to time, on some other subject than the admission of new brethren, and to interest members is the best means of increasing the influence of the Institute. With a sufficient supply of reply postal-cards, an extensive interchange of views could be kept up between members of the Institute in various parts of the country, which, as we believe, would be of immense benefit to them all. Another thing which might easily be managed, and would afford interesting entertainment for Chapter meetings, might be a lantern-slide exchange between the various Chapters. Lantern-slide clubs are just now very popular among amateur photographers, and one or two are even international in extent. With architects, such an exchange would be not only interesting, but useful. The Philadelphia, New York, Boston, Chicago, St. Louis, and San Francisco Chapters, for example, would each arrange to make a collection of lantern-slides of the principal buildings, both new and old, in their respective neighborhoods, and each collection would circulate from Chapter to Chapter through the winter, returning to its owners in the spring, and, during the summer, there would be material enough, in new buildings, for a fresh collection, to be used in the ensuing winter. A lantern could be bought or hired for exhibiting the views in each Chapter room, and it would be difficult to find any entertainment which would attract more members. Many architects are skilful photographers, and the production of slides is so easy, and requires so little apparatus, that the supply could readily be kept up.

THE process of obtaining designs for the new City-hall in New York goes on in a manner which promises excellent results. The Architectural League, having taken the matter under consideration, sent a committee, consisting of Messrs. Bruce Price, Charles I. Berg, George L. Heins, John DuFais, and President Sturgis, to wait upon the Mayor, and suggest, at the outset, the employment of professional advisers of the highest class, to aid both in drawing up terms of competition, and in judging the competing designs. This action of the League, in view of the lamentable result of most competitions for public buildings, was certainly justified, in the interest of the public, as well as of the profession, and the delegation

appears to have been very well received. The Mayor requested his visitors to put their views in writing, to be submitted to the other members of the Municipal Building Commission, which was done, and a list of ten architects added, from whom it was proposed that not more than three should be chosen as advisers. At a subsequent meeting of the sub-committee of the Municipal Commission this communication was read, and discussed at length, and an order adopted suggesting the names of Messrs. R. M. Hunt, William R. Ware and Napoleon Le Brun as the professional advisers to the Commission, these being three of the gentlemen mentioned in the League Communication; and the members of the League delegation, who seem to have been readily accepted as the mediators between the city officials and the profession, were requested to confer with the three persons selected, and report to the Commission the terms upon which they would act as advisers. If things continue to go on in this way, we may hope that New York will succeed in obtaining a new city-hall worthy the greatness of the municipality; but, as one of the Commission is reported to have said that three weeks would be allowed for preparing the competitive designs, and six weeks more for deciding among them, having detailed drawings and specifications made, and signing the contracts, the League representatives may have some more missionary work to do before satisfactory conditions can be arranged. In Europe, where public buildings are desired and intended to be a credit to the community which possesses them, not three weeks, but a year, would usually be allowed for preparing competitive designs for a building of such importance. It should never be forgotten that the more care and study is given to the plans for a building, the more rapidly, efficiently and economically it can be carried out, and to begin building from an ill-digested and hurried plan is to enter upon a long season of changes, delay, vexation and expense. It is true that competitive drawings are, to a certain extent, sketches, and not working plans, but apart from the artistic advantage of careful study of a design, the subsequent preparation of working drawings and specifications is immensely facilitated by long and thorough consideration of the preliminary sketches. With sketches as a basis in which every important point has been thought out, the working plans can be made very quickly by the ordinary office force, while, as every architect knows, flashy, hasty competitive drawings are often perfectly useless for carrying into execution, and the building which they are supposed to represent has to be planned all over again before anything like a working drawing can be made. For instance, we have seen, more than once, competitive perspectives showing lofty stone towers, rising from what the plans represented as the middle of a hall, or other large rooms; and, as a stone tower cannot well be suspended in mid-air, or rest upon a roof, it is obvious that a radical remodelling, either of the plans or the elevations, would be requisite before the design could be carried out. To a certain extent, such designs are fraudulent, as they deceive by falsely representing that a certain plan and elevation, both of which are probably attractive, can go together, but, in the hurry of a three-weeks' competition, it is impossible to avoid some misconceptions of the sort, which may have serious consequences.

THE new building for the Manhattan Life Insurance Company, which is to be sixteen stories high, is to have its foundations built by a method familiar enough in bridge engineering, but rarely used in building, although we think there have been several other cases in which it has been employed. The soil in that part of New York is a fine sand, about fifty feet deep, overlying rock. It would be hazardous to put so heavy a structure on the sand, but to excavate the sand in order to carry piers down to the rock would be likely to undermine the neighboring buildings, especially as the sand is saturated with watsr. This difficulty is to be overcome by sinking caissons, or cylinders of steel-plate, to the rock, so that the sand can be excavated from the inside of the cylinders without fear of affecting the neighboring soil. In the case of the Manhattan building, however, a modification of the ordinary system is to be introduced, about the merit of which we may be permitted to entertain some doubts. In order to enable the excavation inside the caissons to be carried on under water, they are made with a tight top like a diving-bell, and air is forced into them, so as to keep the exterior sand and water from entering while the workmen dig away the sand from the inside and under the edges. To remove it entirely, pipes are provided, through which it is forced by the atmospheric pressure. As the caissons hold a large volume of air, there might be some difficulty in sinking them to their place; so it is proposed, while the men are excavating inside, to have masons at work outside, building the stone foundation piers on the flat top of the caisson. The excavation inside the caisson is so regulated that the caisson sinks about as fast as the pier on top of it is built up, the masons thus working always above the water-line, while the caisson sinks farther and farther below it. When the caisson reaches the rock, the workmen inside level the rock, so as to give it a firm bearing, and then fill it with concrete, which, we are told, is to be "carefully packed," so that the space from the rock to the roof of the caisson may be solidly filled, and the whole is left in place, the building thus standing on cylinders of steel-plate filled with concrete, surmounted by piers of stone and brick.

WE do not suppose for a moment that the Manhattan Company's architects and engineers have left any point unprovided for, but, to the ordinary constructor, there seem to be some difficult conditions to be met. Any one who will try to float a tumbler upside down in water, and build a pier of blocks on it, will probably be convinced that an inverted cylinder full of air, and floating in water, forms a very unstable foundation. Of course, in the present case, the sand on all sides helps immensely in preventing the caissons from tilting in either direction, and it may be all that is reqiured, but there certainly seems to be a chance of lateral movements, which would be anything but favorable to the piers. Moreover, unless the architects have some recipe for concrete which is superior to anything we are acquainted with, we do not see how they can be sure of filling the caissons so that the concrete will remain exactly at the top, without either swelling or shrinking. The "careful packing" of the material after the space between the top of the mass and the roof of the caisson gets too small for men to work appears to us an impossibility, and we can only surmise that it is intended to fill the remaining space with soft concrete, put in through a tube, dependence being placed on hydrostatic pressure to compact it. In many cases this would answer well enough, but it is hardly credible that such concrete, even if of good materials, would not either shrink or be so spongy that the weight of sixteen stories, acting upon it through the medium of a thin metal plate, would not make some impression upon it; and, particularly where three or four piers are built on a single caisson, as is the case in certain places, any movement of the top plate of the caisson would be objectionable; while the use of inferior cement, disposed to swell in setting, for the sake of filling the caisson completely, would be a dangerous experiment.

THE students of German, of whom there are many among young architects, will be interested to know that the Federal Government of Switzerland, together with the governments of several of the Cantons, adopted, on January 1 last, a new system of spelling. The new system, which is that advocated by Konrad Duden, in his dictionary, has been for several years gaining in favor in Germany, and it has for some time been fashionable among the writers of *fin de siècle* novels to write "tot" for "todt," "Tier," instead of "Thier," "Teil," in place of "Theil," and so on. Now, however, the reformed system has so commended itself to more serious writers that it seems likely soon to be adopted in all German-speaking countries. The *Schweizerische Bauzeitung* formally changed its style of spelling on the first day of the year to agree with the new official system, expressing its belief that the old style would soon look antiquated, and that it was best to join at once in the reform. To a person familiar with German the new spelling presents no difficulties, but young students are likely to be puzzled at meeting in their reading with a whole range of words beginning with T which are not to be found in the ordinary German-English dictionaries. It is not many years since a spelling-reform movement was begun here, mainly supported, we believe, by Mr. Melville Dewey, or, as he then wrote it, Melvil Due, at present librarian of Columbia College, and while the world is in a mood for such things, no language needs a reform more than English.

THE ILE-DE-FRANCE SCHOOL OF ARCHITECTURE.[1] — III.

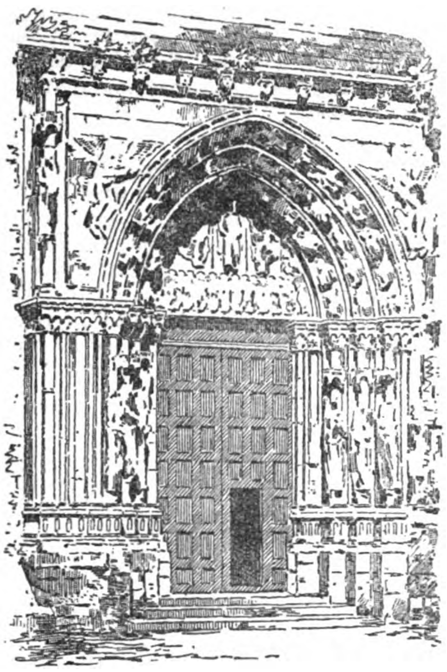

Fig. 13. South Portal of Notre-Dame d'Etampes.

DURING the transitional time and for more than a quarter of a century thereafter everything not immediately connected with the broken arch, with ribbing or the flying-buttress, continued to be improved and perfected in the direction of Romanesque forms. In the capitals, the curve became freer and freer; they were more deeply and delicately chiselled; storied and grotesque subjects and interlacing patterns were abandoned for conventionalized foliage, then the latter gave way to vegetable forms copied from nature; the abaci, which were merely bevelled prior to 1060 or 1080, were carved out as mouldings, complicated at first but tending gradually toward a big torus separated from the fillet by a cavetto. The pillars were simplified, on the one hand, and made more complex, on the other: in the first case they were reduced to the monocylindric column; in the other they formed bundles of colonnettes. The latter were adorned with rings, a decoration much in vogue in the Picard school, but coldly received by the Parisian proper and abandoned everywhere from the middle of the thirteenth century. In the cathedral of Laon it was almost abused [see "*Cathédrale*," Fig. 55].

The transformation was accomplished earlier and more rapidly in the doors than in the windows. From 1145 to 1150, the Gothic type of door with statues, canopy and statuettes appears in an almost complete form in the north transept of Saint-Denis, and we find it without many variations in the western façades of Notre-Dame of Chartres (see *American Architect* for August 2, 1890, "Religious Architecture," Fig. 10), and of Notre-Dame of Senlis, at Notre-Dame of Étampes (Fig. 13), at Saint-Loup-de-Naud, at Saint-Ayoul of Provins (Fig. 14), as well as in the sister façades of Notre-Dame of Mantes (Fig. 15), and Notre-Dame of Paris (see *American Architect* for August 2, 1890, "Religious Architecture," Fig. 2), — in these last with a beauty of ornamental sculpture which has never been surpassed in France. Through Chartres the type was reflected on Le Mans and Angers.

The windows long maintained the semicircular arch and sometimes the *formeret* circumscribed them exactly, in spite of the triumph of the broken arch in the vaulting. Their archivolts were enriched with mouldings which the Picard architects were fond of disposing in zigzags, at the risk of making them too heavy; the same peculiarity occurred in the large arches; the exaggeration to which the system was carried may be estimated at Bury.

It was in the belfry that the Romanesque window found its last refuge. At Sarcelles, in Notre-Dame d'Étampes, at Vernouillet and a hundred other places, very finished towers may be seen without a single broken arch in them, but resting on a framework of pointed arches. To French artists of the twelfth century this seemed the most natural thing in the world, for the disposition is repeated in Champagne, Burgundy, Anjou, and even in Angoumois.

More radical changes were effected in the twelfth century in the form and position of the belfries. The central belfry made its appearance; however, it was not generally adopted anywhere except in Picardy, and it was rarely erected above a very broad nave or intersecting space, for in such cases a corresponding height would have been necessitated; a disproportion of this kind would not have disturbed a Norman architect, but it seemed in poor taste to a Parisian. In Saint-Gilles at Étampes gables were ingeniously arranged at the base of the central tower to cover slanting walls designed to furnish a final smaller base. We do not know of a single stone central belfry at Paris; all of the towers of the eleventh, twelfth and thirteenth centuries still standing, and all those whose position can be determined — at Saint-Germain-des-Prés, Saint-Germain-l'Auxerrois, Saint-Pierre de Montmartre, Saint-Martin-des-Champs, the abbey of Saint-Geneviève, Saint-Julien-le-Pauvre, Saint-Germain de Charonne (also Notre-Dame d'Auteuil, before 1880) — rise, or rose, on the right or left of the entrance to the choir. This fact has had a powerful influence on French cathedrals, — not one in Ile-de-France, Picardy, Champagne, Touraine or Maine, at Limoges, Bordeaux, Bayonne, Rodez or Narbonne, has ever had a central tower; the leaden spire is the nearest approach to it. The only exception occurs at Laon, and there Norman imitation is apparent in its disposition as a lantern, a disposition that was transmitted to the charming church of Saint-Yved at Braisne. Though Martin Lalye and Jean Vast, in the middle of the sixteenth century, took the risks of rearing, at Beauvais, a lofty tower on the four pillars at the intersection of the nave and transept,

Fig. 14. Portal of Saint-Ayoul, Provins.

Fig. 15. Cathedral of Mantes.

[1] From the French of Anthyme Saint-Paul, in Planat's *Encyclopédie de l'Architecture et de la Construction*. Continued from No. 892, page 54.

a catastrophe soon taught their admirers that the original intentions of the builders had been misconstrued.

The square tower had the preference over the octagonal from the twelfth to the sixteenth century. There are beautiful twelfth-century specimens of the latter at Tracy-le-Val, Cambronne-lès-Clermont, Foulangues, Orgeval, Rueil, etc., not to speak again of the unique central tower of Poissy.

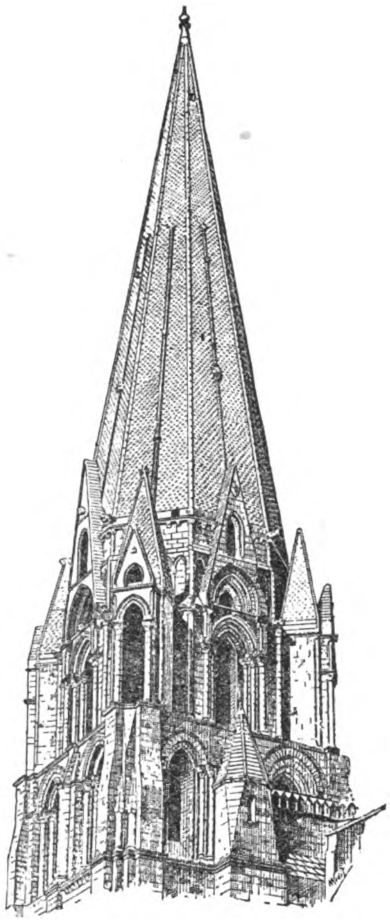

Fig. 16. Old Spire of Chartres Cathedral.

The crowning of the belfries was a subject of the liveliest interest to the architects of Ile-de-France in the twelfth century. During the preceding century, for want of something better, they had made use of low four-sided stone roofs, such as may still be seen in the department of Oise, at Morienval, Pontpoint, Rhuis and Rethondes. We can detect no local transition between these squat pyramids and the soaring spires; the constructors of some neighboring region, which we believe was either Touraine or Anjou, must have lent a helping hand to those of the French school, for how else can we account for the two masterpieces of the style in the period prior to the thirteenth century, — the abbey-belfry of Vendôme and the old spire of Chartres (Fig. 16), one of our national glories? We do not know whether some contribution may also have come from Normandy, or whether even this province antedated Ile-de-France in the composition of church towers. The famous examples are sufficient, and, if necessary, that of Chartres alone, to explain the prevalence of the two types from the second half of the twelfth century in the crowning of square towers. The one most widely employed was naturally the simplest, — above the upper cornice a large octagonal spire, with small pyramids at the angles following the slope of the former, and with dormers (often wanting) on the faces. Nogent-sur-Marne, Athis, Bougival (Fig. 17), Mareil-Marly, Sarcelles, Conflans-Sainte-Honorine [see "*Flèche*," Fig. 8], Vernouillet, Limay, Nesles, Saint-Leu-d'Esserent, Saint-Vaast-de-Longmont, etc., have belfries of this kind; one quite-well-preserved example existed down to 1880 within the present walls of Paris, at Auteuil; another on Suger's basilica, was still the pride of the inhabitants of Saint-Denis a quarter of a century ago [see "*Flèche*," Fig. 10]. In the second type, which is plainly richer and more effective than the first, the small pyramids are transformed into spirelets or turrets that extend down as far as the seat of the upper story; to make place for these, the latter is octagonal in form, the oblique sides often being concealed by the turrets and the face-walls having no opening but one long bay. The most successful of these, after the old spire of Chartres, are the charming belfry of Notre-Dame d'Étampes, for the twelfth century, and that of the cathedral of Senlis [see "*Clocher*," Fig. 6] for the thirteenth. The towers of Notre-Dame at Laon [see "*Cathédrale*," Fig. 56; and "*Clocher*," Fig. 8], which were completed about 1220, and are also of the second type, though without turrets, are on a par perhaps with the belfry of Senlis; they attracted the attention of contemporaries abroad — copies of them are encountered in the German cathedral of Bamberg and in the Sicilian church of La Martorana at Palermo. At Notre-Dame of Paris [see "*Clocher*," Fig. 7], the turrets lose in relative importance and are brought forward slightly so as not to interfere with the disposition of the bell-chamber story, which is square and retains its double bays.

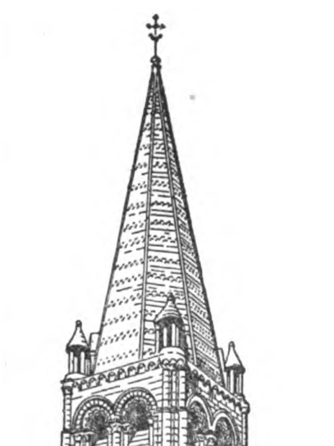

Fig. 17. Belfry of Bougival (Seine-et-Oise.)

[To be continued.]

CONSTRUCTION.[1] — XIX.

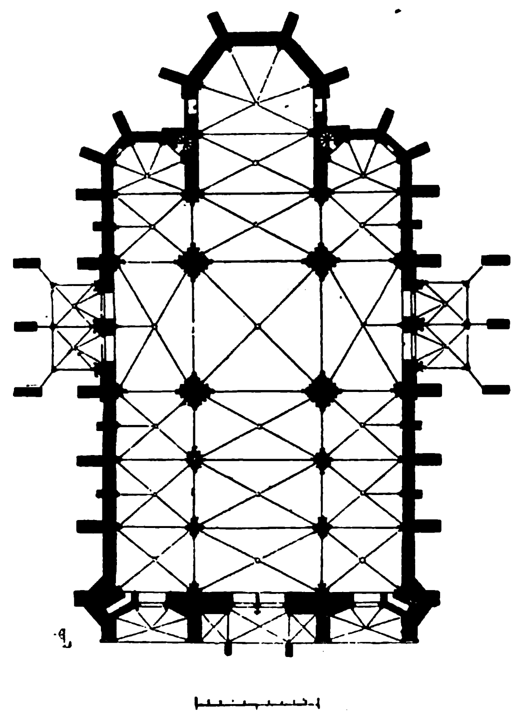

Fig. 102. St. Urbain, Troyes.

IT is true, that, in the example of construction just given to our readers, there are grave defects and we do not disguise them. That outer scaffolding of stone, which forms the whole strength of the building, is subjected to the action of the atmosphere; it seems as if the builder, instead of trying to protect the vital parts of his structure, had taken pleasure in exposing them to all the chances of destruction. His system of equilibrium depends upon the absolute resistance of materials too often imperfect. He evidently wishes to astonish and he sacrifices everything to this desire.

But beside these grave defects, what profound knowledge of the laws of equilibrium! what subjection of matter to the idea! what a theory, fertile in applications! Let us never imitate these subtile constructions, but let us profit boldly by the acquisition of so much knowledge. But to profit by it, we must cultivate and exercise it.

In the article "*Chaînage*," we have shown what were the processes used during the Middle Ages for anchoring the edifices. For the long beams of wood, used during the Romanesque period, the builders of the thirteenth century, seeing that these soon decayed, substituted cramp-irons uniting the stones composing the courses. This method was never, at any time, employed with such singular exaggeration as in Ile-de-France. There are edifices, like the Sainte-Chapelle-du-Palais at Paris, where all the courses, from base to summit, are fastened by irons. At Notre Dame in Paris even, it is seen that all the structures raised or repaired after the early years of the thirteenth century are, at heights not far separated, fastened by cramps set in lead. Certainly these builders had not entire confidence in their very ingenious devices and their innate good sense made them soon feel that they were carrying their boldness too far. The way in which these anchorages are arranged shows, moreover, that what they feared most was the bending or twisting of the piers and walls;

[1] From the "*Dictionnaire raisonné de l'Architecture Française*," by M. Viollet-le-Duc, Government Architect, Inspector-General of Diocesan Edifices, translated by George Martin Huss, Architect. Continued from No. 889, page 7.

and in that regard the system of stone posts adopted by the Burgundian architects had a marked superiority over the dangerous use of cramp-irons sealed up in solid masonry. It must also be said that the builders of Ile-de-France found difficulty in procuring long

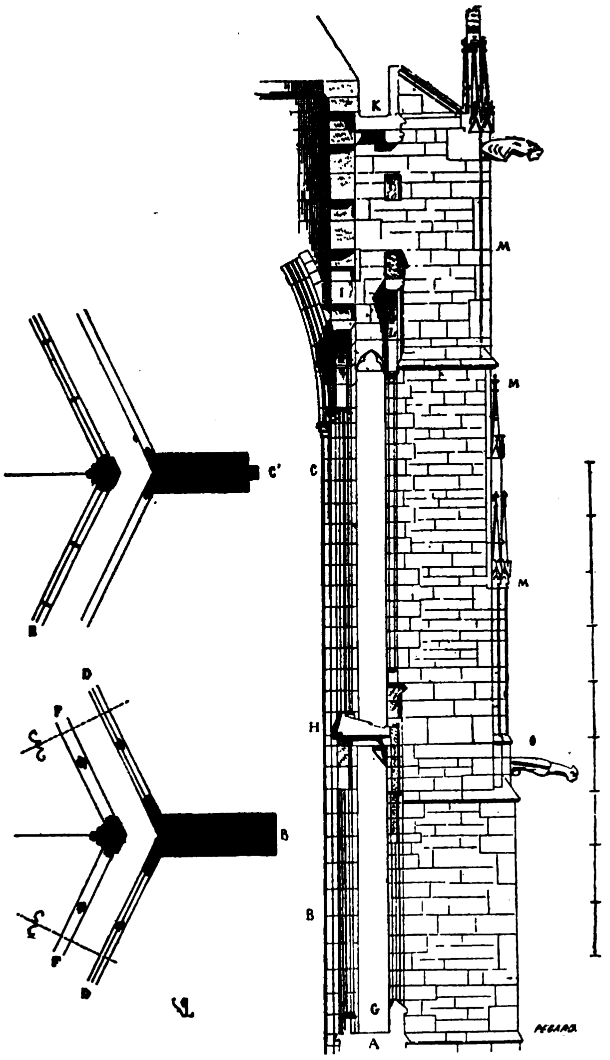

Fig. 103. Buttress of St. Urbain, Troyes.

stones, resistant enough and capable of being set with impunity against the cleavage, while in Burgundy these were common and of excellent quality.

It is time now to introduce our readers to an edifice which, in itself alone, embodies and at the same time skilfully exaggerates all the theories of the builders of the Gothic school. We refer to the church of St. Urbain of Troyes.

In 1261, Jacques Pantaléon, a native of Troyes, was chosen pope, under the name of Urbain IV, at Viterbo; he died in 1264. During his pontificate, he wished to erect at Troyes a church under the name of St. Urbain; so this monument was begun and rapidly progressed; nevertheless, it remained unfinished, as the successor of Urbain probably did not think it proper to continue the work of his predecessor. Such as it is, the church of St. Urbain of Troyes shows, through the master-builder, who was intrusted with its construction, a singular hardihood and a truly amazing knowledge of building. If the date of the foundation of the church of St. Urbain and that of the interruption of the work were not historical facts of undeniable authenticity one would be tempted to suppose that this edifice was built toward the beginning of the fourteenth century.

We ourselves, owing to proofs so incontrovertible, have long hesitated before believing that the thirteenth century had seen begun and finished what remains of this monument; being in the habit of relying first of all upon archæological signs, we could not give to the construction of Saint Urbain a date earlier than the fourteenth century; but a profound study of the structure has shown that historical tradition was in accord with fact. They no longer built thus in the fourteenth century. Only, the architect of St. Urbain was one of those artists in whom the most advanced theoretical principles are allied to a profound experience, to a skill that is never at fault, to a sure knowledge of the quality of the materials, to infinite resources in execution and to natural originality; he was, to put it briefly, a man of genius. His name is unknown to us, like those of most of these laborious artists; if Urbain IV had sent from Italy an architect to build his church at Troyes, certainly we should have known it, but we should not have to spend much time over his work, for Southern Italy at that time was raising only structures that do not furnish types suitable for study.

The plan of the church of St. Urbain of Troyes belongs to Champagne. The choir recalls that of the little church of Rieux, that we have already given: upon the four piers of the crossing must have been a tower, probably very high, if one examines the broad section of these piers. Two other spires flanked the entrance, accompanied by a porch projecting like that of the church of St. Nicaise, at Rheims. The central tower was not commenced and the nave and façade remained unfinished. From what remains of these parts one can give an exact account of what this church was to be. The choir and the transepts are complete. Let us cast our eyes first upon the plan of the church of St. Urbain (Fig. 102) taken at the ground-floor; this general view is necessary in order to appreciate the different parts of its structure. This plan presents points of support that are solid, thick and resistant, a very simple general arrangement.

Placed between two streets, two deep and well-protected porches give entrance to the two arms of the transept. Above the ground-floor, at a height of 3.30 metres, the whole building looks like a structure of glass of extreme lightness and supported by the buttresses, which alone remain solid, as far as the gutters above. Hence it is the construction of these buttresses which must occupy us in the first place.

Figure 103 gives one of the buttresses of the apse parallel to one of the lateral surfaces. The solid basement, 3.30 metres high, ends at *A*. At *B′* is drawn the horizontal section of the pier at the level *B* and at *C′* the horizontal section at the level *C*. *D* is the open-work set with glass outside of the gallery *G*; *F* is the free open-work holding the ceiling *H*, which serves as a passage on the level of the supports of the large upper windows; *E*, the mullions of these glass windows. The archivolts of the windows, whose extremity is at *I*, serve as wall-arches to the great vaults. The gutter, *K*, above is supported on the inside by the filling placed upon the archivolts *I* and on the outside by an arch *L* and a whole system of open-work, whose details we will soon give.

The open-work at *D* and *F* is partly set in grooves, so that these are both independent of the piers and are real sashes of stone, enclosed between the buttresses.

Let us say one word about the materials which enter into this structure, for their quality is partly the cause of the system adopted. Even at Troyes, they could not procure freestone; for the region furnished only chalk, good, at best, only to make the filling for vaults. The architect of St. Urbain had to bring stone from Tonnerre for the facings and in order to economize these materials, transported at great cost, he used, so far as he could, a certain stone called Burgundian, found several leagues from Troyes and proving to be only a coarse limestone, firm enough, but in shallow courses and cutting badly. It is with these latter materials that he built the solid part

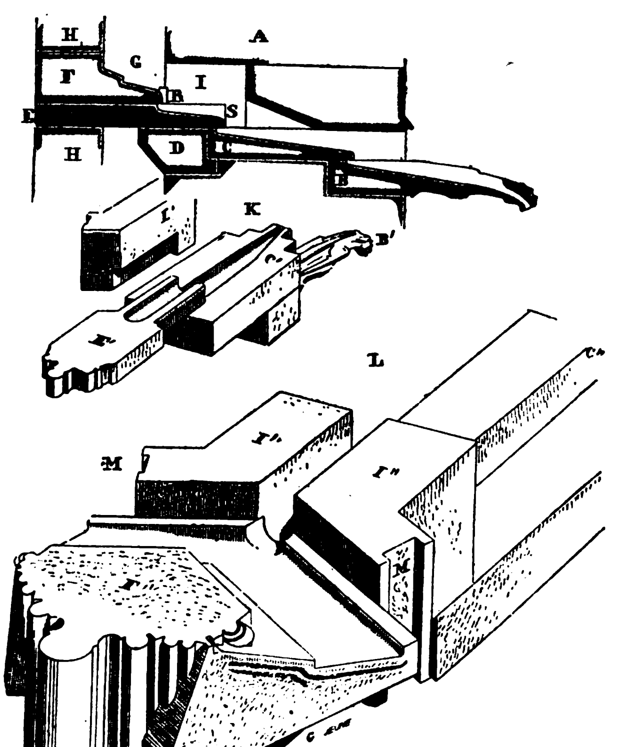

Fig. 104. Detail of Pier and Buttress, St. Urbain, Troyes.

of the piers, covering their outer surface *M* with great slabs of stone from Tonnerre, set against the cleavage and finely cut. So, also, with the stone of Tonnerre he built the inner piers, the open-work, the arches, the gutters and all the delicate members of the structure

now, the stone of Tonnerre here used is a species not very thick, but of great resistance, firmness and compactness and capable of being set against the cleavage without danger. In fact, this building is a structure of scappled stones, solid but clumsy, finished off with a fine and very beautiful stone, used with the strictest economy, as we would use marble to-day.

The lightness of the open-work and the mullions surpasses all that we know of in this class of work; and yet the materials used have been so well chosen and the elasticity of the structure is so complete, that very few of the pieces are broken. Moreover, as the structure is perfectly solid and well balanced, the injuries occurring to the open-work and windows have no importance, since the latter can be easily replaced, like real sashes, without affecting the principal structure.

The anatomy of this building must be examined with the greatest care. We shall try to bring out the details vividly before the reader.

First, then, let us take that part of the pier included between H and O — that is, the ceiling of the gallery and its lintel joining the inner pier to the outer one, the casings of the open-work and the drainage for the water at this point.

At A (Fig. 104) we see the section taken through the axis of the outer and inner piers. B is the gargoyle throwing off the water collected in the passage G — that is to say, not only the rain which falls vertically upon this slab, which is a small matter, but that which beats against the glass; C is the gutter of the roof, acting as bond-stone — that is, extending through the whole thickness of the pier; D is the console sustaining the lintel E, which serves as gutter-stone and joins the inner pier H to the outer one; F is the course of the roof of the gallery and supports the gutter; I, the two cheeks forming outer facings and holding the lintel gutter E, as shown at I' by the perspective detail K. In this detail the piece E' is the lintel-gutter, C', the second gutter-stone and B' the gargoyle. The large detail L shows, in place, the two pieces I at I'', the gutter C at C'' and the roof piece F at F'' with the lintel E at E''. All this arrangement is made with the greatest care, the stones being well cut and well set; accordingly no rupture is seen.

Let us notice that the gutter-lintel E (detail A) is left free in its course from R to S under the pieces I — that is to say, the bed R S is thick and cemented only after the settling of the structure has produced its effects, so as to avoid all chance of rupture.

We see at M (detail L) the rebates destined to receive the outer glass windows of the gallery and at N those destined to receive the inner open-work supporting the roof-piece and the mullions of the windows.

How can open-work so delicate as in these two windows be kept in vertical planes?

That on the interior is only 21 centimetres thick, and that on the exterior 22 centimetres including all projections. Their rigidity is obtained by the simplest means, in that the arching of each of them, included between the rebates of which we have already spoken, is in one piece. Each section of open-work, then, is composed of but three pieces: two jambs and an upright slab pierced with openings.

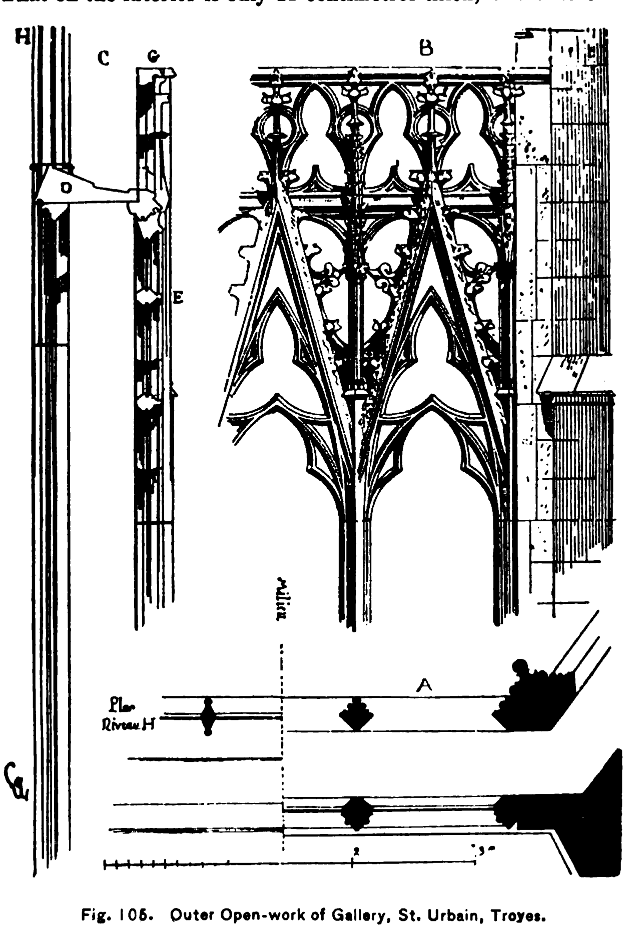

Fig. 105. Outer Open-work of Gallery, St. Urbain, Troyes.

We must not forget what has been said previously about the materials used in building the church of St. Urbain. The architect had

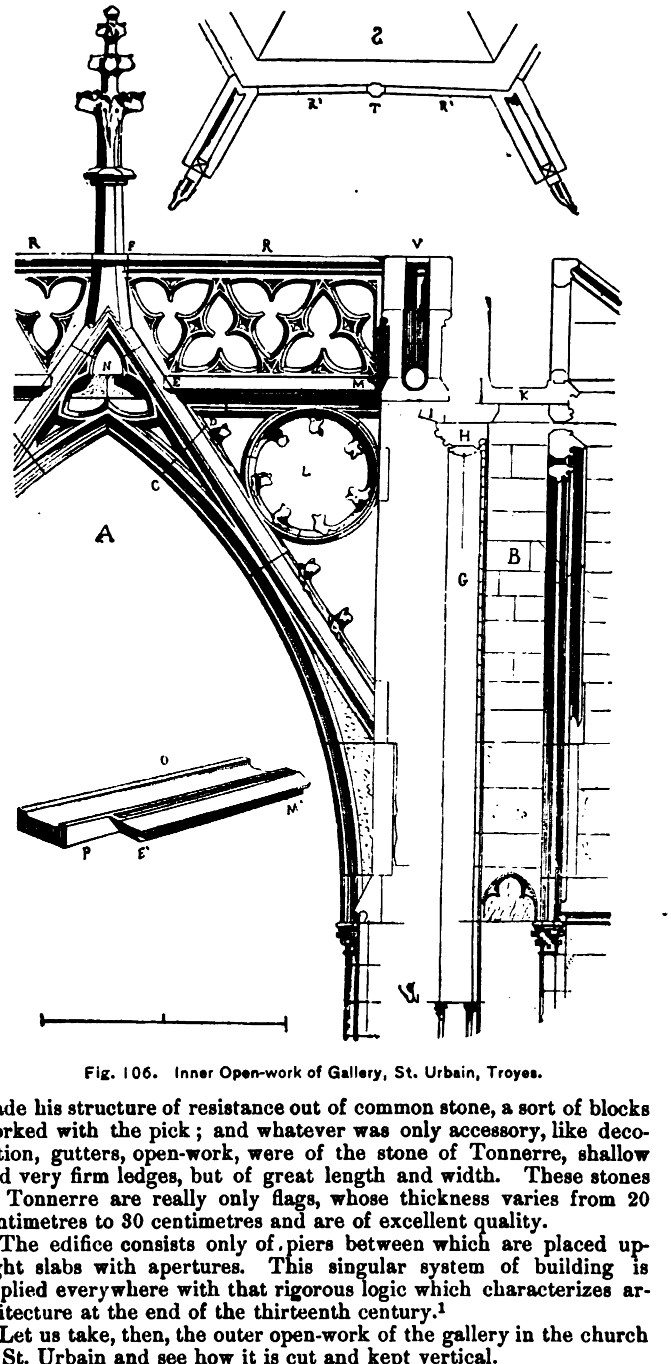

Fig. 106. Inner Open-work of Gallery, St. Urbain, Troyes.

made his structure of resistance out of common stone, a sort of blocks worked with the pick; and whatever was only accessory, like decoration, gutters, open-work, were of the stone of Tonnerre, shallow and very firm ledges, but of great length and width. These stones of Tonnerre are really only flags, whose thickness varies from 20 centimetres to 30 centimetres and are of excellent quality.

The edifice consists only of piers between which are placed upright slabs with apertures. This singular system of building is applied everywhere with that rigorous logic which characterizes architecture at the end of the thirteenth century.[1]

Let us take, then, the outer open-work of the gallery in the church of St. Urbain and see how it is cut and kept vertical.

We represent it here in the plan A (Fig. 105), in its outer elevation B and in its section C.

The roofing-stone D, making the two sets of arches firm and forming a gutter and a support for the upper windows, is made of one or two pieces joined to the pieces under the inner pillars out-lined in F'', in the detail of Figure 104.

To give more weight and more rigidity to the great slab, which is cut out so as to form the exterior arching set with glass (Fig. 105), whose section is drawn at E, this slab has a railing G joined to it and made of the same piece, so that the gutter D, forming the ceiling of the gallery, rests upon a projection reserved on the interior along the outer arching, while the lower bed of this ceiling is made fast to the inner arching, also composed of a large slab set upon end, with windows cut through and held at its extremities by the rebates N, of our detail L, in Figure 104.

We ought to say that to produce a more pleasing effect, the architect has given the interior arched open-work a more delicate design and a different form from that of the exterior arching; and these two openings produce the most brilliant pattern and wonderful effects resulting from the insertion of stained glass.[2]

[1] How does it happen that we, who to-day have cast-iron, or can procure stones of excellent quality and in large pieces, have not thought of putting into practice the method so happily applied in the building of the church of St. Urbain? What resources might we not find in the study and the use of this system, so true, so simple and so well adapted to many of our edifices in which are demanded large windows, lightness and swiftness of erection?

[2] The decoration which encloses the chancel of St. Urbain was probably not admired by everybody at Troyes; for, some years ago they had the idea of concealing it by an enormous decoration of pine wood and stucco, painted white.

Let us now look at the upper part of the structure of the choir of St. Urbain, for there the architect has displayed a remarkable sagacity.

If we refer to Figure 103, we shall notice that the upper windows are set in a vertical line with the coping of the roof at *I*, that their archivolts serve both as wall-arches and as relieving-arches for carrying the timbers and that the gutter *K* rests partly upon a projection reserved above this archivolt and partly upon a piece of open-work *L*, fixed about 50 centimetres in front of the window.

Figure 106 gives at *A* the outer surface of this open-work and at *B* the section made through *C D E F*. In this section, we find at *G*, the section of the window, at *H*, its archivolt-wall-arch and at *I*, the vault.

The open-work supporting the gutter *K* consists of an arch reinforced by a gable, performing the duty of a tie.

The open circles *L* help to sustain the gutter along its extent from *E* to *M*. This gutter, in each compartment, is made only of two pieces of stone, joined at the apex of the slopes at *N*; and each of these pieces is cut as indicated in *O*, its junction with the open-work taking place from *E'* to *M'* and the part *P* being cut out and having no drip-stone, in order to let the summit of the gable go through.

The pattern of the gable and the circular openings *L* are faithfully drawn upon our figure. The finial (its shaft penetrating the balustrade) and the point of the gable are made of a single piece of stone, so as to add the necessary weight to the extremity of the pattern. But to avoid all chance of the gable being thrown down outward, the two pieces of the balustrade *R* are not placed in a straight line, but form an angle slightly obtuse, as shown in the plan *S*; *T* being the shaft of the finial at the top of the gable and *R' R'* being the two parts of the balustrade cut each from a single slab.

Hence the apex *T* of the gable cannot be thrown outward, supported as it is by the two open-work slabs *R' R'*, which rest on the tops of the piers pierced by gargoyles to drain off the water, as seen in *V*.

This is rather an arrangement of carpentry than a structure of masonry; but we must not forget that the quality of stone used at St. Urbain lends itself to such a structure and that, thanks to these artifices, the architect has been able to raise a structure of extraordinary lightness, which consists, in reality, only of a masonry of rough stone and upright slabs, pierced with openings.

The flying-buttresses which support the great vaults of this church above the chapels are built in conformity with this system of open-work and of large pieces of stone set like props [see "*Arc-Boutant*," Fig. 66].

The architect of the church of St. Urbain (his scheme being accepted) has been faithful to his principle in all the parts of his construction. He has understood that in a church so light, built with stones and slabs, it was necessary to allow this open-work great freedom in order to avoid ruptures; wherefore, he has fitted these slabs only into grooves that permit the masonry to settle, without breaking the delicate tracery which constitutes the walls.

We see by examining Figure 106 that the gutters are free, almost like pipes and that, even in case of a break, the dripping of the water could cause no injury to the masonry, since these gutters are suspended over vacant spaces without, by means of these open gables.

It was necessary to be bold to conceive a structure of this kind; it was necessary to be skilful and careful in execution, to calculate and forsee everything and to leave nothing to chance; so, this structure, despite its excessive lightness and despite neglect and unintelligent repairs, is still solid after five hundred and sixty years of existence.

The architect required from the quarries of Tonnerre only slabs 30 centimetres thick at the utmost, of great dimensions, it is true, but of comparatively light weight; he thus avoided the greatest expense at that period — that of transportation. As to the handiwork, it is considerable; but in those days this did not cost the most.

The church of St. Urbain will often appear in the course of this work, for it is certainly the utmost limit to which building in stone can attain and as an architectural composition it is a masterpiece [see "*Arc-Boutant*," "*Balustrade*," "*Croix*," "*Fenêtre*," "*Gargouille*," "*Porche*," "*Porte*," "*Vitraux*"].

(To be continued.)

PROPOSED GREAT CATHEDRAL IN MEXICO. — A City of Mexico despatch says: Bishop Manuel Arnezquita of the Tabasco diocese of Mexico, has issued an appeal to all Catholics of Mexico, the United States, and Canada for money to be used in the erection of a great cathedral on the bank of the Grigalva River, on the spot where the first mass was said on the American continent. At present there is nothing to mark the spot. The Catholics of Mexico are contributing liberally towards the project. — *New York Evening Post.*

Nothing is more ridiculous than that scaffolding of stucco, which displays its pretentious wretchedness in front of one of the most charming conceptions of the art of the thirteenth century in its decline. The barbarism that destroys is certainly more dangerous than the barbarism of the authors of the high altar of St. Urbain; but, still, what would the friends of the arts in Europe say, if they saw a façade moulded in plaster, erected in front of the western façade of the court of the Louvre, under pretext of embellishment? How much progress we have still to make in order not to merit the title of barbarian, which we give so freely to periods when certainly no one would have been permitted to hide a work executed with intelligence, care and talent, behind a useless overgrowth, coarse in material and workmanship, without form and without taste, a product of ignorance, combined with the most ridiculous vanity.

THE COLD WEATHER AND FIRES.—VOLUME OF THE YEAR'S WORK. — IMPORTANT BUILDINGS NOW IN HAND.— THE CRERAR BEQUEST. — MONUMENT TO COMMEMORATE THE CHICAGO MASSACRE. — THE SCHILLER THEATRE. — THE BOARD OF EDUCATION ESTABLISHES A BUILDING BUREAU.

CHICAGO, like most other places in the United States, has been visited by a cold wave more continuous and more severe than has been experienced for five or six years. As a result of our succession of very open winters, it had been begun to be looked upon as a settled fact that the climate of our city was becoming of a much milder nature than that which characterized the so-called good old days, and, consequently, the winter months were looked upon as a season in which much work could be accomplished in the building line. Depending on this, it was expected to bring many buildings to completion by the first of May of this year, and so the present extremely cold weather has been a decided set-back and disappointment. Some of the large buildings of skeleton construction are either partially or entirely enclosed in pine jackets. The Athletic Club's structure is entirely enveloped, while the big Marshall Field building has three or four stories encased. This, however, with the present low mercury, is only a short step towards affording anything like a suitable temperature to work in. Salamanders are resorted to in very large numbers, and there has been the usual amount of fires resulting from them. The Massachusetts State Building at the World's Fair grounds had a very narrow escape from fire from this cause. One of the large Fair hotels, which was eventually to be transformed into a "bichloride-of-gold" institution, has been reduced to ashes, though in this case the blame does not rest with the salamanders. Quite extensive alterations are being made in the home of the Calumet Club, one of the oldest and largest clubs of the city. Probably a match carelessly dropped among some shavings was the cause of the fire that reduced that fine building to a mass of ruins. A rather amusing example of the proverbial Chicago "push" was given in the action taken by its officers and Board of Directors: while the engines were still playing on the smoky pile these men met at the house of the president, appointed a committee to look up temporary quarters and report the next evening, and it was settled that a new and much finer building should take the place of the old one.

Aside from the difficulties connected with the cold which those interested in the Marshall Field building have to overcome, the public is being somewhat amused at the struggle which is transforming the bridge, which was to connect the old and new buildings, into a veritable Bridge of Sighs. Between the present retail store and the new structure an alley runs, a disadvantage which was to be overcome by throwing across it a bridge. This the adjoining property-owners refused to permit, as one bridge will considerably diminish their light, while, if one is constructed, there is no reason why a dozen similar ones should not spring into existence in mid-air. An injunction has been obtained to stop the work, but the struggle seems likely to continue for some time, as it is very important to the owners that the two buildings should be connected.

It will certainly be a great disappointment to many owners that it will be impossible, owing to the many set-backs of this winter, to have their buildings completed by the first of May. The amount of building in Chicago has, as a matter of course, been very large this year, though, owing to the fear that a new law might this year be aimed against the sky-scrapers, there was a general tendency to hurry on such buildings in the last months of 1891, which reduces the increase of money spent in 1892 over that expended the year before. The first eleven months of the year 1892 show the increase in number of operations over those in 1891 to be 328 — 11,504 being erected in 1892, while 11,176 were constructed in the corresponding eleven months of 1891. The frontage of the buildings of 1892 exceeds those of 1891 by 38,980 feet — 308,634 being the figures representing the frontage of 1892, while 269,654 are the figures for 1891. The entire eleven months of 1892 have seen expended $59,-371,220, while the statistics of 1891 showed $52,000,500 as the sum given to building purposes. Architecture is certainly fast founding, in our city, monuments which are not a disgrace to the profession, and many are the institutions, either public or private, whose housings the city can well be proud of. Either among those which have been erected during this last year or are in process of construction at present, the following are a few: The Chicago Public Library, which, when completed, will cost $1,250,000; the Illinois Central passenger depot, seven stories high, with a cost of $1,000,000; the Art Institute, cost $800,000; the City Criminal Court building, seven stories high, with a cost of $450,000; the Young Men's Christian Association building, thirteen stories high, cost $800,000; the Armour Institute, $250,000; the Chicago Historical Society building, two-and-a-half stories, cost $150,000; the Hahnemann Medical College cost $100,000; Walker Museum and three dormitories costing $300,000. This does not include the large Newberry

Library, being erected on the north side, which, with its four stories, will cover a half-square, and which has been before mentioned in these letters. Aside from these buildings of a semi-public character, there are the Medinah Temple building, twelve stories high, to cost $500,000; the Monadnock-block extension, which, when it is accomplished, will be the largest office-building in Chicago, and will cost in the neighborhood of $1,000,000; the sixteen-story Old Colony Building cost $600,000; the Columbus Building cost $800,000; the Security Building cost $500,000; the Teutonic, which calls for an expenditure of $500,000 also; the building of the Hartford Deposit Company cost $600,000; the twelve-story Boyce office-building cost $250,000; the twelve-story Gillespie office-building cost $150,000; the Dexter Building cost $100,000; the Isabella cost $200,000; the Ellsworth, at a cost of $300,000, and the new Marshall Field structure, which will cost $800,000. A number of other large edifices might swell the list of these large building enterprises, but, from their less-known character, it would be only tiresome to enumerate them.

To those of us who have known Chicago as an uninteresting provincial town full of unwarrantable self-conceit, the change that has come over her as she buds into dignified maturity is very noticeable. Her nature was, to begin with, very unlovable, and even her most ardent admirers had to admit there was little of beauty in it; but now that she has blossomed forth into strong, fresh, many-sided maturity, with its widespreading interests, even her least ardent admirers have to admit her to be interesting. In whichever direction a person's tastes may lead him, he can now find material with which to satisfy them in the Chicago of to-day, and there is certainly an incentive to be found in the feeling that these interests are each one the beginning of a greater future, which future, in a measure, depends on individual exertions. We have passed the trying times when exertion only resulted in keeping alive a struggling body: now exertions show for something, and those who meet in the interests of art, music, literature, science have, or soon will have, their own especial homes. Music has the splendid hall of the Auditorium; Art will have an abiding-place between the walls of the Art Institute; literary interests will be found centred in the rooms of the new University, where such men as Van Holtz and Professor Moulton lecture to those who care to hear; the Newberry and Public libraries will shelter those of studious habits, while the antiquarian can be permitted to forget the present within the walls of the Historical Society. It has also just been decided that the Academy of Science shall have a new home, and that it shall be located within the limits of Lincoln Park.

In counting the libraries of our city, we are obliged to hold our breath concerning the bequest of over two millions of the late John Crerar, designed for the use of building and endowment. The will has been contested by relatives of the deceased, and now the decision of the Supreme Court of the State is being anxiously awaited by Chicagoans. The directors of the projected library, not having as yet been incorporated as a body, have been incapable of taking any legal action concerning the library. It is reported, however, that they have not been idle, and that one of the best-known architects of the country has been consulted about the plans for the building.

Relative to the home of the Academy of Science there has also been much public discussion, and the feeling of many not especially interested in the association is that it is a great pity to grant building space to the society in Lincoln Park. As a matter of precedence, it may be bad to allow a building to be erected within the Park, but, architecturally, the prospect is pleasing that a fine building may have such picturesque and suitable surroundings. It is devoutly to be wished that it may be a fine building, and that it will be an added feature to the beauty of the Park, rather than a blot upon it. Since the large fire of 1871, this excellent association has been three times burned out, and that it has continued to exist at all would seem to indicate a considerable amount of vitality. Not to be out-done in magnanimity by the North Side park, one of the West Side ones has offered space for a natural history museum, and report has it that plans will soon be obtained.

A recent addition to the possessions of the city is the gift by one of our public-spirited citizens of a drinking-fountain, placed in the recess between the City Hall and the County Building. That it is as good as it is makes it doubly a pity that the work is not still better. The design of the general shape of the fountain is fairly good, while the details are commonplace. The chief figure is that of Columbus, to commemorate this year of 1893. The figure, — in fact, the whole work, — which might have been a delight to the thousands who daily pass along this busy thoroughfare, is simply what might be expected to come from the hands of a very mediocre artist assisted by casters whose reputation for good work about equalled his own. If the lesson only could be learned, that what is worth doing at all is worth doing well, how fortunate many of us would consider ourselves in finding our "things of beauty" a joy forever. The building which forms the background for the fountain is about as poor as it can well be; but, had the fountain itself been fine, it would have been a double delight to have found something really artistic in the dirty, dingy, disorderly court.

Another gift is about to be given to Chicago, and one feels like saying with the children: "Heavy, heavy hangs over thy head. Which shall it be, fine or superfine?" It is a bronze group, to be located on Eighteenth Street, just east of the old cotton-wood tree, which alone for so many years has marked the spot of the Chicago Massacre. The donor is Mr. Pullman, of world-wide railroad-car fame. The location for such a group is exceptionally fine. The sculptor is Carl Roll-Smith, a Dane. The monument will consist of a central group of six figures of heroic size, mounted on a granite pedestal, on whose four sides will be bas-reliefs depicting the incidents of the evacuation of Fort Dearborn and the subsequent massacre. The pedestal will be ten feet high, and the group about nine. The casting will be done in New York, by the Henry Bonnard Company, the plaster-cast of the figures having been already received by them. In the group is seen, in the foreground, the Pottawattomie chief, Black Partridge. He is saving from death by the tomahawk in the hands of one of his own tribe Mrs. Helm, the wife of one of the early settlers, whose name is well known in local history. According to the etiquette of Indian warfare, Black Partridge had the right to dispose of his war-prize as he felt inclined, and, having been on friendly terms with the Helm family, he preserved Mrs. Helm from a horrible death, in which act he is represented, his arm about her, warding off the blow with which another savage is threatening her. At the back of the group, Dr. Van Voorhees, the post-surgeon of the fort, is being killed by an Indian. In the foreground, a child sits crying. Twelve children were tomahawked on this day memorable in Chicago history. That Dr. Van Voorhees is being pierced with a spear points to a disregard of historical detail which is to be regretted. The worth of the work cannot be at all decided upon by the rough drawings which have been shown. The subject is certainly one of great interest, and capable of very dramatic treatment, and it is to be hoped that it may prove a rival in point of excellence to the fine group of Indians in the northern portion of the city. It is rather interesting to know that Kicking Bear, the celebrated Sioux brave who last summer was a prisoner at Fort Sheridan, served as a model for the figure of Black Partridge, while from Short Bull, another Sioux prisoner, was made the studies for the other figures. The subject of the front bas-relief is a bird's-eye view of this famous battle of Chicago. The bas-relief at the back has for its subject the evacuation of Fort Dearborn. Captain Wells, who had come to the assistance of Captain Heald, the commander of the post, leads the way with his Miami braves, while the garrison and settlers follow. On one side is shown the death of Captain Wells, and on the other Black Partridge returning a medal which was given to him by the United States Government for his friendliness to its two commanders, Heald and Wells.

The matter of insurance has been adjusted on the Athletic Club building, the burning of which last November was mentioned in these columns. It is said that there are chances of the building now being completed by the first of June. To accomplish this undertaking, great effort will have to be made, and it looks now as if it were safe to say no effort would be of any avail. The building, as it is planned, will give the most luxurious housing to the club of any of its kind in the United States. If the published descriptions are carried out, it will be a most interesting building to visit.

One of the buildings finished within the last year, of which no mention has been made in these columns, is the Schiller Theatre, which is a very successful structure both on the exterior and inside. The exterior is successful in the peculiar style of its architects, displaying their peculiarities in a marked degree, and is also an example of one more large building in our city whose façade is entirely constructed of terra-cotta, so colored and moulded that, to the unsophisticated, it appears like stone. A great deal of geometrical ornamental work of decidedly Moresque appearance gives a peculiar character to the building, which is still further accentuated by a polygonal, dome-like structure, similar to the one on the Transportation Building. An excessively wide, projecting cornice without brackets or dentils is particularly noticeable. The interior, in color and design, seems to be a connecting link between the design of the Auditorium Hall and the coloring of the Transportation Building of the World's Fair. In the theatre it is extremely successful, being a most pleasing mingling of green, gold and red, green being the body-color used. A curious feature is the shape of the proscenium-arch, which is in the form of concentric, semicircular Romanesque arches, each with a deep reveal. The finish of the lower floor is in mahogany, which harmonizes with the red in the decoration. The pale-green, being approached by this red through the gold, makes an especially charming effect. On either side of the wall of the first galleries are paintings incorporated into the scheme of decoration much as they are at the Auditorium.

The Board of Education in this city has this month decided on a plan which, if carried out with success usual in such bodies, will be fruitful of most grave results. The idea is no less than to establish a Building Bureau. Lately, work on school-buildings has been done unusually well, and at a very reasonable rate. The Board, however, did not seem to feel it was getting the most for its money, and has, consequently, created this Building Bureau. In this bureau, the superintending architect shall provide all necessary plans and specifications, which shall be the property of the Board. He shall be given a room in the City-hall, and shall keep regular office-hours. The duties of the architect are to be the supervision of construction and repairs, and the employment, under the direction of the Board, of the necessary draughtsmen and inspectors. Considerable opposition was aroused in the Board by this plan, as many of the members felt that no first-class architect could be obtained for the salary to be paid, and that before long the appointment to the office would be the result of favoritism; men unworthy of the position would be the

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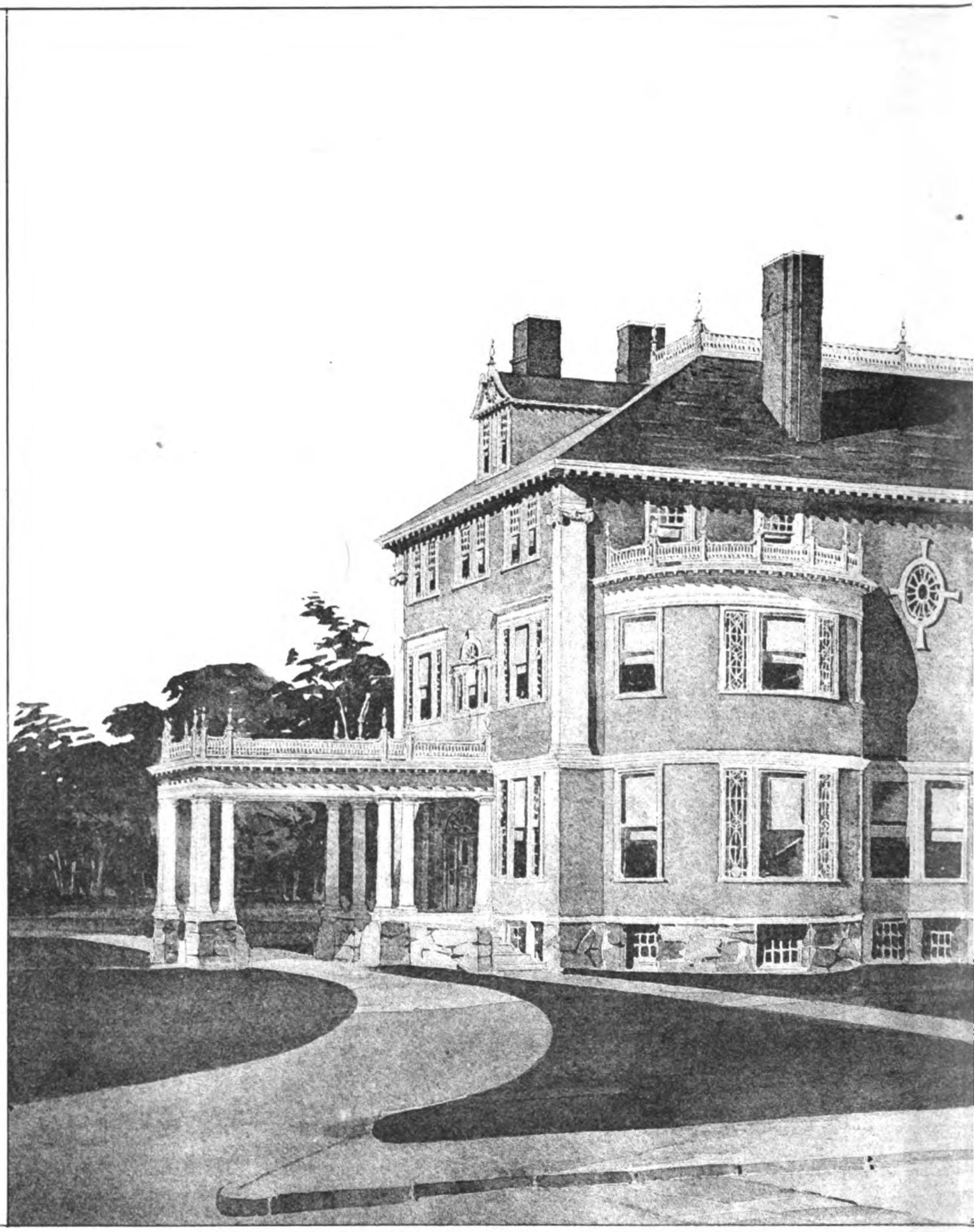

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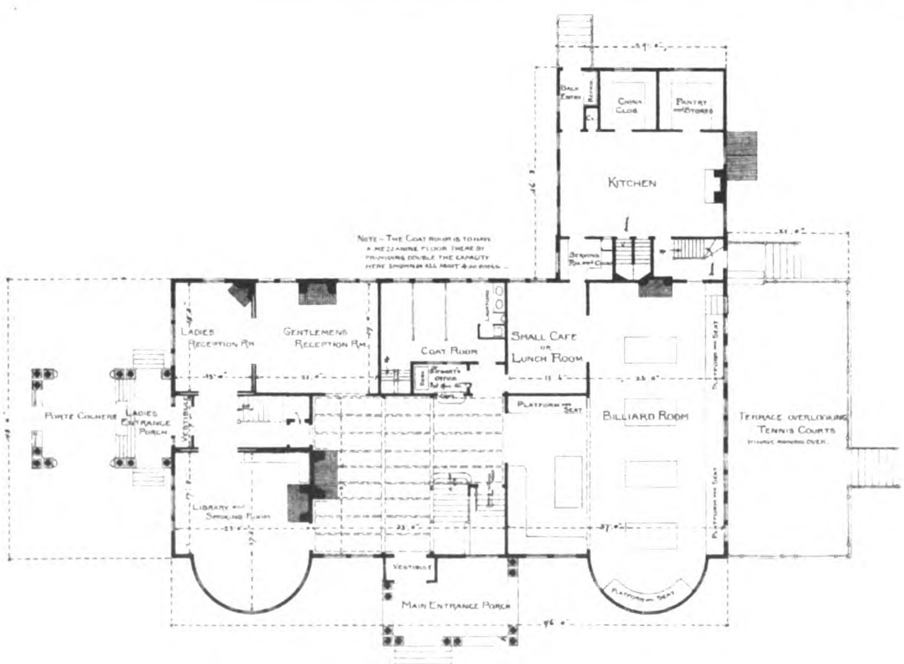

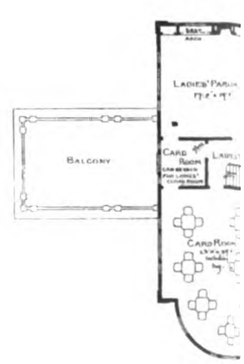

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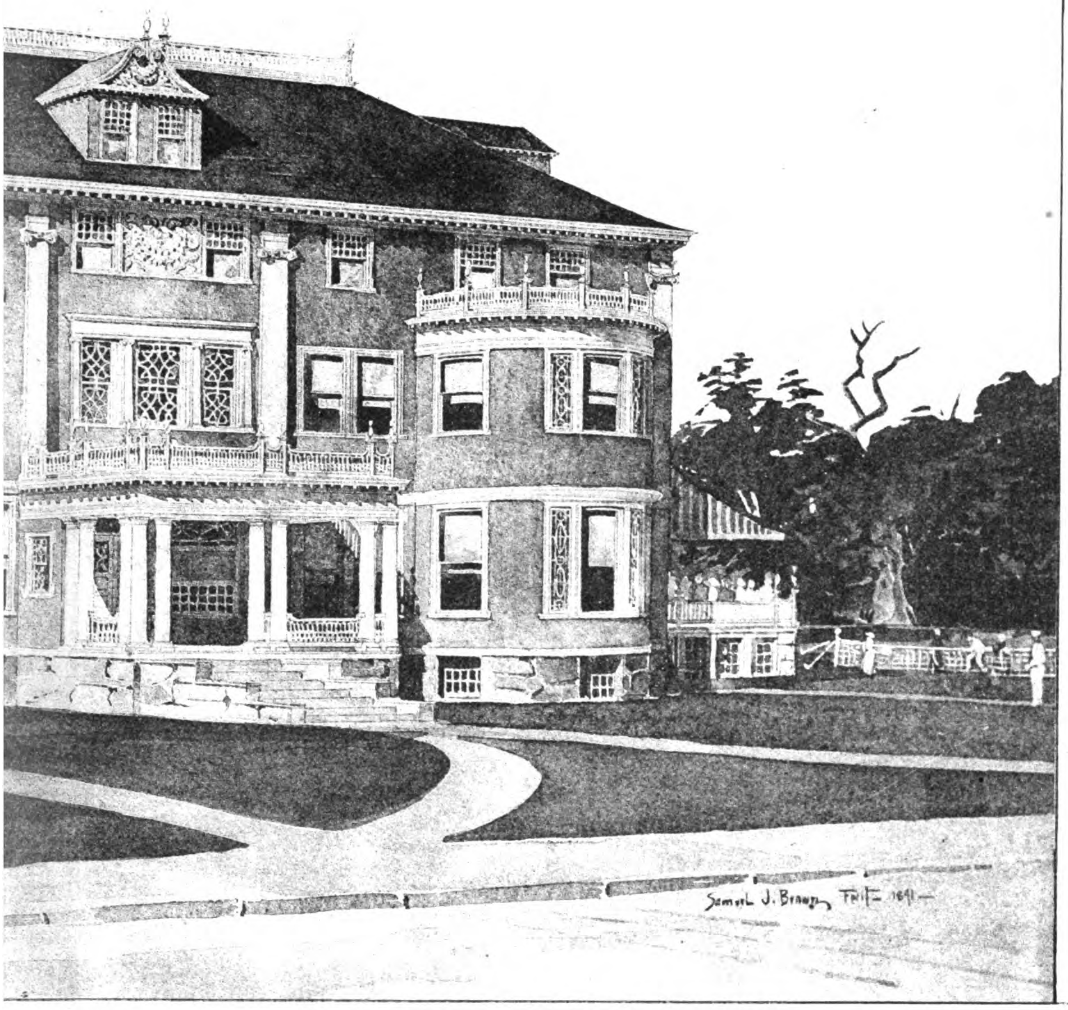

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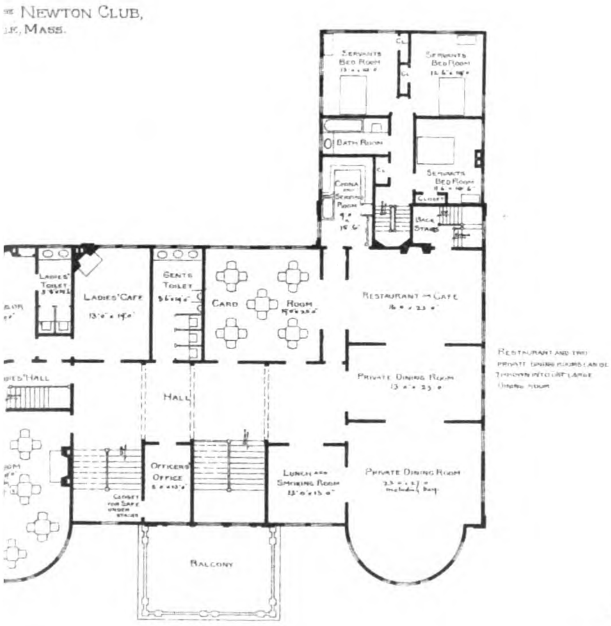

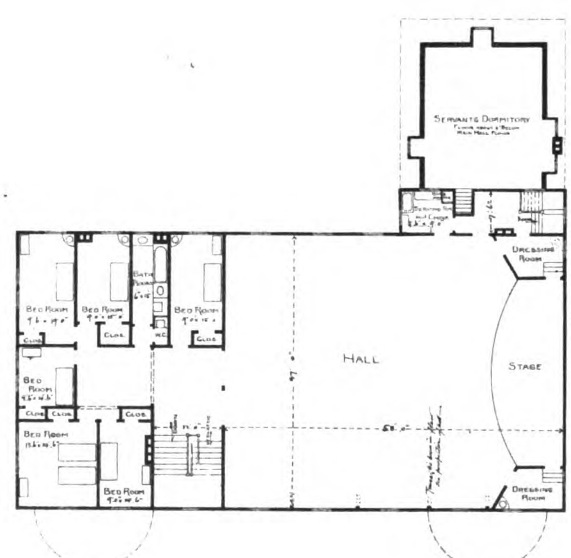

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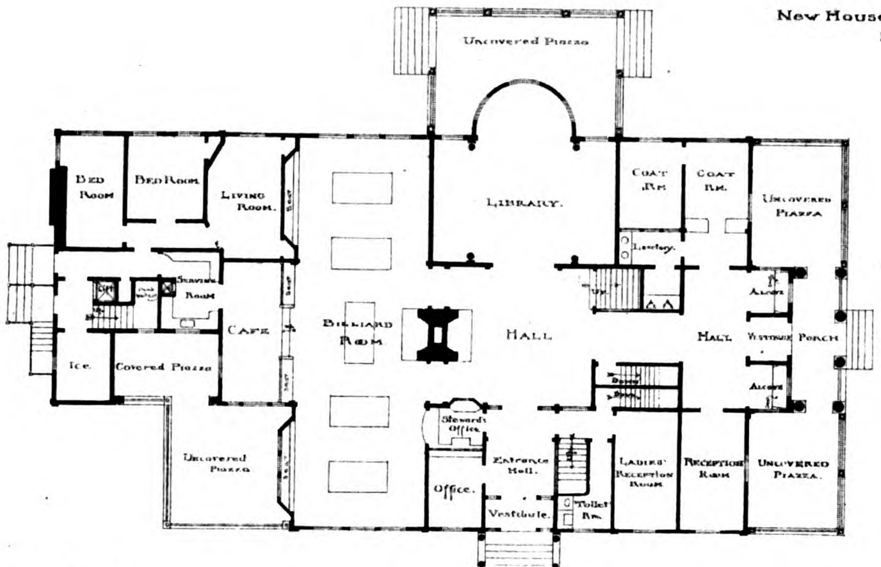
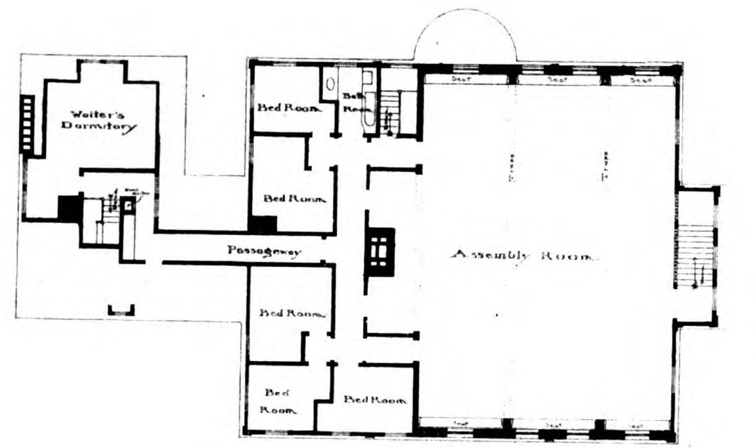
Newton Mass

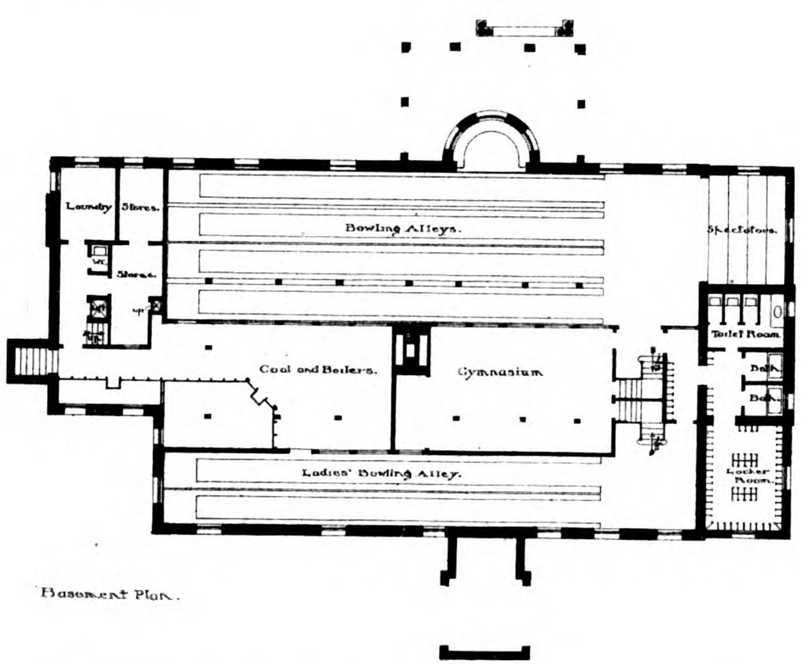


Plan of First Floor.

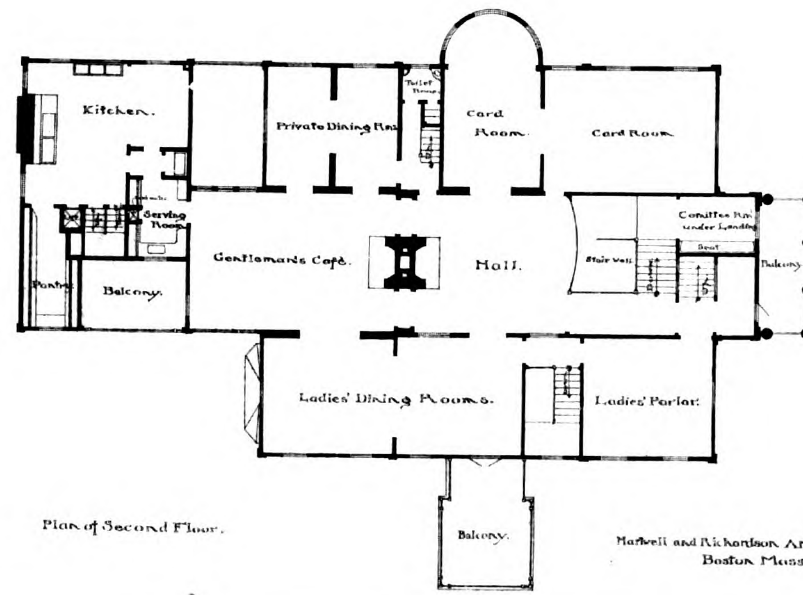
Porte Cochère.



Plan of Third Floor.



Basement Plan.



Plan of Second Floor.

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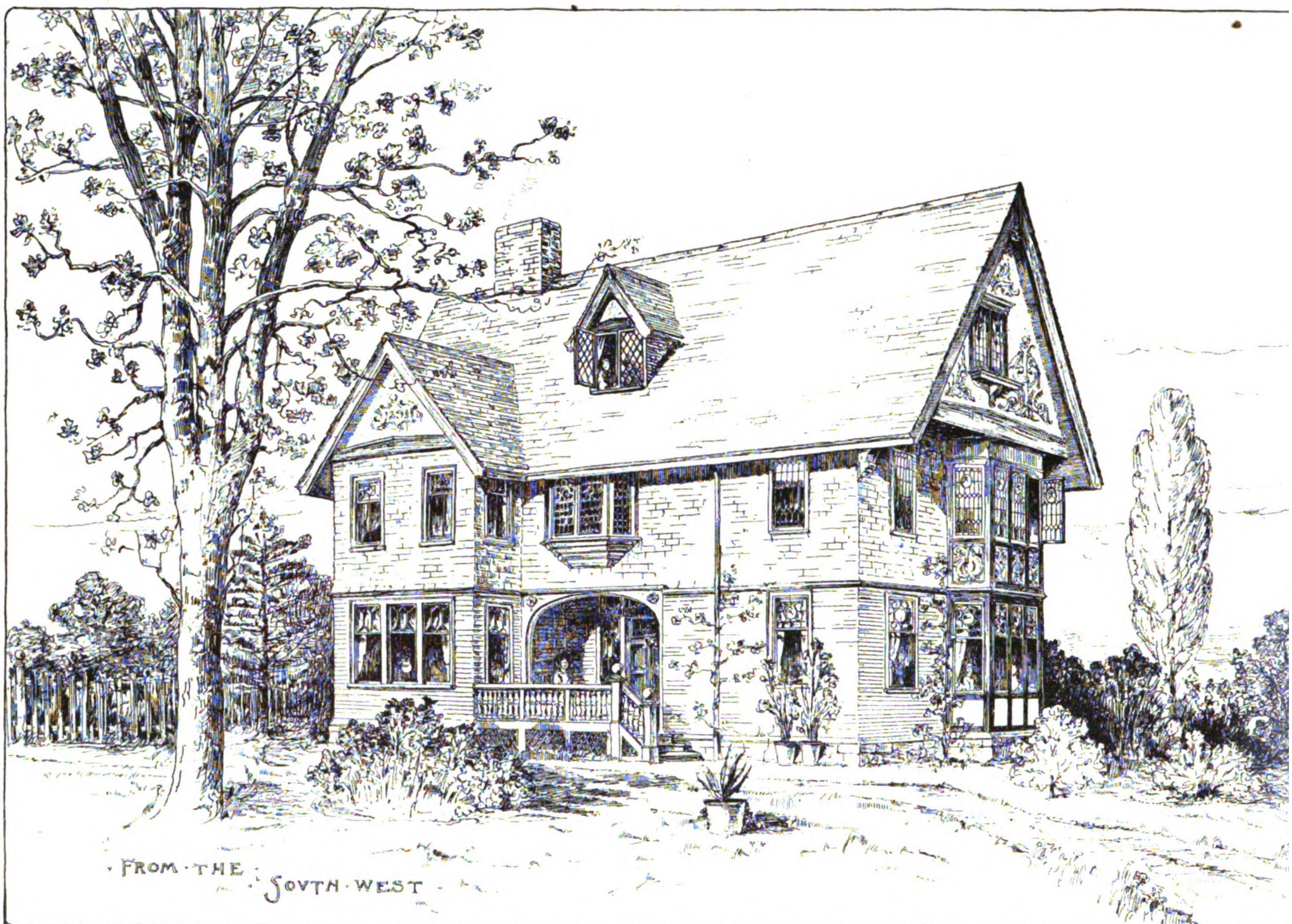

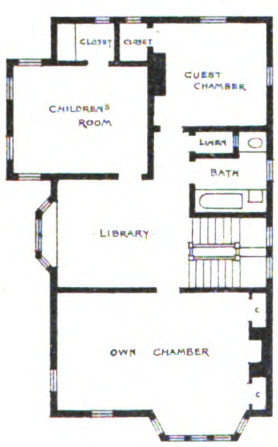

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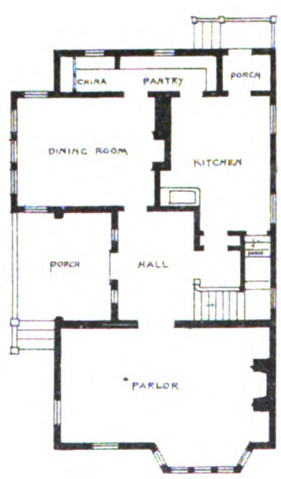

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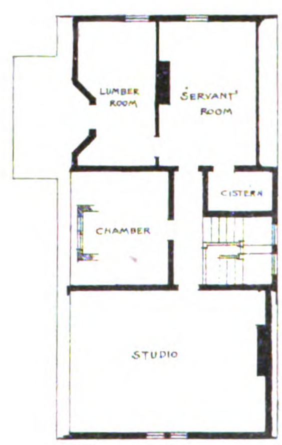

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AN ARCHITECT'S HOME : THE RESIDENCE OF ROBERT BROWN, JUNR

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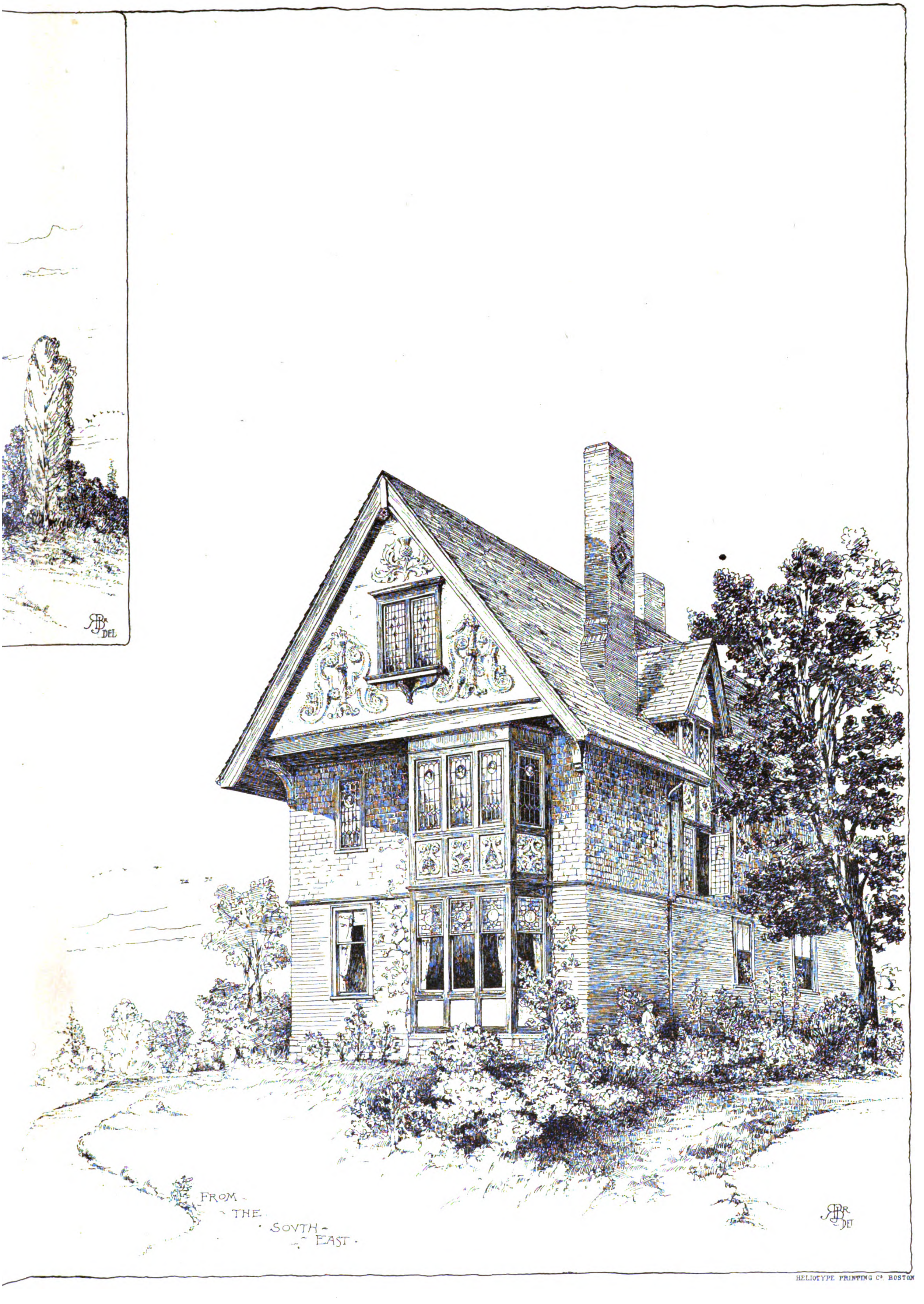

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ones to attain to it, and, consequently, poor work would be the result — work which, when poor, would be doubly dangerous in this especial place, as the health, and perhaps lives, of so many children would be in question. The bureau plan was finally settled upon, though the matter of salary seems not yet determined.

The cold weather has made work at the World's Fair grounds difficult. Among the workmen, the Turks and Japanese suffer the most, while of all the guests, so far, the Esquimaux are the most hilarious, and dogs and sledges glide over the icy ponds to the boys' merry cry of "Kyak! kyak!" A rather arbitrary proceeding seems to be the order forbidding the Columbian Guards to wear ear-muffs or to have fires in the guard-houses. The banishing of fires in the guard-house seems to have its reason as a precautionary measure, but why ear-muffs should be tabooed in below-zero weather is hard to understand. The ear-muff never pretends to be an especially artistic article of dress, but perhaps, with the proper staff treatment, it might become as picturesque as a Frisian metal coif. At any rate, there is little danger that the wearing of them would become such a settled habit that it could not be broken up during the hot months of next summer.

The pending strike on the grounds spoken of last month has been averted by the entrance into the union of the obnoxious non-union firm that was fortunate enough to receive the mammoth job. The firm still reserves the right to keep part of its establishment non-union, but the part in which will be done the World's Fair work will be entirely under the union management.

An interesting feature at the Fair will be the military display in the form of a perfect camp of regulars. Forty-five acres will be used. Here, eight hundred men, drawn from Uncle Sam's frontier posts, will drill and exercise, and show, in fact, a small corner of an army under camp discipline.

VENTILATION.

Design for Window for a Concert-hall, by M. Ruty. From *L'Art pour Tous.*

ON December 19, a paper under the title of "Sanitary Ventilation" was read before the Surveyors' Institution, and if, in the opinion of some members, it did not reach the usual standard of excellence of the contributions to this society, it was at any rate suggestive and sound so far as it went. The author, Mr. Edward Tidman, is a Fellow of the Institution, and the president, Mr. C. J. Shoppee, occupied the chair during the reading. On the ventilation of our homes and offices the health of the community largely, if not chiefly, depends; but it is a matter almost totally neglected, and even when the aid of "science" is invoked in the person of a self-styled "sanitary engineer" the arrangements are not always effective in bringing wholesome air to the lungs of the occupiers of dwelling-houses. In the discussion which followed the reading of the paper a speaker cited an instance of an elaborate system of ventilation, in which the air was made to circulate, it is true, but only up one pipe and down another, so that the room was "ventilated" by its own vitiated atmosphere. In another case, instanced by the author, a ventilator-pipe from a drain was made to discharge beneath a bedroom window. Happily the dishonesty of the contractor neutralized the ignorance of the designer, as this "sanitary appliance" was only carried beneath the surface far enough to be out of sight, the connection with the drain not being made. The instance is not unique, and is quite sufficient to warrant Mr. Tidman in the selection of his title of "Sanitary Ventilation," to which a somewhat fastidious, not to say captious, critic took so much exception during the discussion. In the vast majority of cases ventilation of rooms is not specially provided for, but fortunately nature — in guise of the native carelessness or cupidity of the building contractors — provides a remedy for this. The unpremeditated openings at joints of doors, windows and floors supply a sufficient volume of air to make up for that abstracted by the wide chimney-mouth of our open fire-grates. Of course this is a deplorably unscientific mode of procedure. It is unhealthy and uncomfortable, but especially is it wasteful; and there is hardly anything less easy to defend than the unnecessary burning of coal, — a most deplorable waste of national wealth.

We have not, however, to do with the ethical aspect of ventilation, but with its practical side. Mr. Tidman says that "there is such a diversity of opinion and practice among the profession as to the proper and most effective system of ventilation and sanitation that clients are bewildered, and they naturally say, 'Where doctors differ, who shall decide?'" We think engineers and architects experience trouble in getting money for the necessary arrangements rather than in the designing of them. Civilization demands that we should pay for fresh water; so must we for fresh air if we would have it without draughts. A point not often considered is the ventilation of stables, and upon this the author touches. In one case, relating to cavalry horses, the death-rate was 180 to 197 per 1,000 per annum. The stables were rebuilt on designs in which provision was made for efficient drainage and ventilation, and during the following ten years the death-rate fell to 28.50 per 1,000. Mr. Tidman says that 75 per cent of town stables are in such an insanitary state as to be dangerous to man and animals, and to this cause is attributed the late attack of glanders and farcy. The quantity of fresh air per hour that is considered necessary for a mixed community of men, women, and children is 3,000 cubic feet each, whilst for men alone 3,600 cubic feet per man are required per hour. If 100 cubic feet of air-space were allowed per individual, with a mixed crowd, the air would have to be entirely changed thirty times an hour, or thirty-six times an hour for men only. In metropolitan lodging-houses thirty feet super, or six feet by five feet of surface, and 240 cubic feet are allowed per person. In police-houses fifty superficial feet and 450 cubic feet are given. Dormitories under poor-law administration must have 300 cubic feet for healthy persons, and 850 to 1,200 cubic feet for the sick. The Education Department requires ten square feet and a height of thirteen feet, or 130 cubic feet per scholar. In the case of animals, horses and cows should have 1,200 to 2,000 cubic feet per head; in army stables the allowance is 1,900 cubic feet.

We all know it is not the easy thing it would at first sight appear, to introduce fresh air without causing draught. To effect this thoroughly the air should be heated before being admitted to the room; but heated air rises, so that it may not, or a large part of it may not, come to the individual. Again, heated air is often over-dry and unpleasant. In large towns, too, the air decidedly wants freeing from floating particles before it is in good condition to breathe. In the Victoria Hospital, in Glasgow, there is a most carefully thought out system of ventilation, in which the air is forced in through hanging screens which are kept saturated by running water; the air, of course, being duly heated in cold weather. This arrangement is highly effective. There may be, and often is, a dense, sooty fog surrounding the building, but the interior atmosphere is as bright as mountain air. Of course an installation such as this is not within the compass of the average householder; but it is remarkable that it is not tried in some of our London theatres and restaurants. During the London fog season — which might be described as the "winter fogstice" — one would pay almost anything to get out of the foul air, irrespective of the merits of the entertainment provided for the money. As it is, fog is one of the greatest enemies to the theatrical manager. Possibly when we have reached a state so entirely metropolitan that all live in flats, arrangements will be made to ventilate whole blocks, windows being constructed not to open, and street doors all air-locks. In the meantime, Mr. Tidman introduces us to an arrangement which is like a Tobin's tube containing a strainer of some textile material. By placing the strainer vertically a large filtering area is obtained. Arrangements are made for removing and cleansing — a most necessary precaution, as any who have seen the cotton-wool filter used in the Houses of Parliament will easily understand.

The paper deals with sewer and drain ventilation also. The author says we are all familiar with the surface ventilators in our roads and streets, and the effluvia given off by them. That is true; and some districts are worse than others. In the parish of Chiswick, for instance, where there is a separate drainage system, and a pumping-station for discharge of effluent water into the Thames just above Chiswick Eyot, we have experienced some of the most disgusting stenches that ever turned human stomach; and we know at one time Mr. Thornycroft and his assistants were fairly driven out of their offices. Of course this is a want of ventilation; not, possibly, a want

of sufficient openings, but a want of the continuous use of these openings. The underground sewers and drains are in some sort a gigantic barometer, and at certain seasons, or states of weather, the air is retained within until it is thoroughly impregnated with the filthy emanations from the mass contained. Then comes a change of wind, a surcharge of moisture and lightening of the atmosphere, when from every man-hole and grating — past every useless trap and cracked drain-pipe — steam the pestilential gases, rich with the seed of typhoid and diphtheria. The County Councils were to have put all this right; but hitherto the test has proved beyond their strength. Perhaps, if cholera come with the summer weather to wake us from our lethargy, and a few die quickly to warn the many who are wasting slowly, then money may be spent, something effective may be done in the way of sewer ventilation and other manifestations of sanitary science, so that we shall all grow rosy, healthy, and strong, and the good St. Cholera will no longer have to walk abroad to scourge us for our shortcomings.

As to what that "something" should be, Mr. Tidman's paper does not afford much light and leading in regard to detail. "Lamp-post ventilators," he says, "are all very well in their way"; and their way, we would add, is rather a poor way. Surface ventilators he looks on as "most objectionable," and for this expression he was taken to task during the discussion. It is, we were told, an axiom of sanitary science that a sewer should be entirely uninclosed to get the most perfect conditions. No doubt, however, Mr. Tidman meant what he said, that surface ventilators are "most objectionable"; and here, we think, he cannot be gainsaid, although they are better than none at all — just as a bad-tempered domestic may be preferable to no service. Lamp-post ventilators, with gas-burners at their base, are said to be excellent extractors. But if the light becomes extinguished — as it easily may be — and the outlet turned inlet, the sewer might become charged with an explosive mixture of gas and air, and most serious results would follow. In dread of this some gas-works have refused to supply gas for the purpose.

The author gives particulars of the system of sewer ventilation carried out at Eston. Here a tall chimney-stack belonging to the Cleveland Salt-works is taken advantage of to ventilate the sewer. The chimney is a high one, the draught being equal to two inches on the water-gauge, which is a good pressure. The chimney is 220 feet high, and the average temperature at the base 475° F. The velocity of the passing air would be over 2,000 feet per minute. On the other hand, the sewer is small, viz, main sewer twelve yards lineal three feet, brick, 220 yards lineal two feet, brick, and 768 yards lineal eighteen inches, sanitary pipe. This is in straight lines. There are two tributary sewers, one 600 yards and one 986 yards long. A twelve-inch pipe was taken from the nearest man-hole to the chimney, and the surface ventilators were stopped. A number of readings at the various ventilators were taken, and from these it will be seen how little hope there is of getting much relief from a system of ventilation by factory chimneys. Readings were taken with the cover of the hole (where the experiment was being carried out) removed, and also with it on. At a distance of sixty-six yards from the chimney, with the cover off, velocity of wind in feet per minute was 1,174, and 1,394 when sealed. At the next nearest station, 128 yards, the air passed at the rate of 235 feet with the cover off, and 178 feet with it on. At 166 yards it drops to 152 feet and 136 feet respectively; at 531 yards, seven feet and eighteen feet; at 731 yards, five feet and two and one-half feet; whilst at 986 yards the readings are given at zero, from which we conclude that the effect was unfelt. Now it must be a very busy manufacturing district which has such a factory chimney as that at Eston available on the line of sewer at distances of every half-mile or so.

It is evident that in residential districts and rural places, at any rate, we cannot have this chimney-stalk ventilation; but Mr. Tidman gives us an example of what is the proper system. As every house contributes its quota to the sewers, so should it be made to do its share towards ventilation. East Grinstead is a small place in an open district, and no doubt in any case the people would be long-lived and the mortality low. But when we find that in 1889–90 it it was only 8.4 per thousand, and that for the average of the last three years it was but 10.10 per thousand per annum; that from typhoid, scarlet fever, and diphtheria the deaths were *nil*; that the mortality of children under one year was but 5.8 per cent of those born, and that in the last report issued there was record of but one death from zymotic diseases, other than whooping-cough, during the year, — when we consider these things we are justified in expecting that there are exceptional causes tending to healthfulness. The author quotes these facts, and attributes them to the system of drainage ventilation. "It is a rule here," he says, "that no builder is allowed to insert a trap in his house-drain unless he place a four-inch vent-pipe on the sewer side of the trap, so that each house does its share of sewer ventilation. There is also a four-inch ventilating pipe placed at the highest point in the house-drain, in addition to a four-inch ventilator to each soil-pipe, carried up three feet above the highest window." "By this means alone," he continues, — and we think he does not speak without justification, although he was called to book during the discussion, — "by this means alone hundreds of lives are preserved that under certain other conditions would have been sacrificed." Perhaps some day, in the millennial future, when election petitions have made the party politician impossible, then legislators will turn their attention to matters appertaining to our practical well-being, and a comprehensive, workable scheme of sanitation will become universal in the country.

In the meantime every local authority is bound by law, so Mr. Tidman tells us, "to cause the sewers belonging to them to be constructed, covered, ventilated, and kept so as not to be a nuisance or injurious to health, and to be properly cleansed and emptied." That we are glad to hear from a Fellow of the Institution of Surveyors; but it would have been even more gratifying if the many surveyors who crowded the theatre of the Institution to listen to and discuss the paper had told us how the law is to be put in motion. Who shall survey the surveyors? Is there a means of enforcing penalties, supposing they exist? If not, we would suggest one which would have the additional advantage of solving a point of scientific interest. It was stated during the discussion, — and the matter is said to be supported by high authority, — that there are fewer microbes in the sewers than in the open air above. We would propose, therefore, that in each district where the sewers are not "constructed, ventilated, and kept so as not to be a nuisance or injurious to health," a committee, including the local surveyor, the local board of health, or a selection of county councillors, should be confined for a few days in a chamber drawing its atmosphere only from the main sewer. If they emerged in their wonted health from the ordeal we should then look with more composure on unventilated sewers and defective house-drains, and one of the chief bogies of civilization would be laid. — *Engineering.*

AN ARCHITECT'S HOME.

WHEN an architect sets out to build his own house his clients and friends naturally have some curiosity to see what he will do in the combined rôle of client and architect. He is often supposed to be able to do just as he pleases, — limited only by the depth of his purse, — but after all he is subject to conditions similar to those which govern his clients. He has either to get a builder and build by contract, or become the builder himself, buying the materials and hiring the labor, — both ways have their disadvantages.

Another condition may be this: that however much the architect indulges his vagaries in planning or arrangement, he must not build a house totally unsuitable to live in by ordinary mortals who, in this transitory life, might come after him.

Much as the writer would have preferred to have built the walls, to the height of the first story, at least, of brick, he had to content himself with a frame wooden house built in the usual orthodox way. The lower story is covered with clapboards laid narrow and without corner-boards; the upper story is covered with shingles, also the roof, but it is intended ultimately to replace the roof shingles with plain red tiles.

The gables are filled with plaster-work with some ornamentation in relief, this was first modelled in clay and then cast in cement.

The writer, from his experience in this work, would recommend modelling the ornament *in situ* on the plaster while soft. All the exterior plaster-work is colored a light brownish yellow with *water-color*, not oil, just as such work in Europe is usually done, and has been done for hundreds of years.

The gable rafters, the timbers forming the bay-window, and in general all those bounding the plaster-work are of cypress, *stained, not painted*, a dark-umber color. By this method the grain of the wood shows to a certain extent, and a fitting framework for the plaster-work is formed.

The roof shingles are painted the color of red tiles; the shingles on upper story are stained a cinnamon color, the clapboarded lower story is painted a kind of Indian-red, which will be finally changed to a brown. The sashes are painted white, and the doors a bluish-green color.

The roof in plan is perfectly simple: a ridge running north and south, with a gable at each end, broken only by the lesser gable over dining-room, and one small gable over staircase. The pitch of roof is 52° and no snow will lie on it for any length of time. Another advantage is gained in the interior on the attic floor, where in height and cubic capacity the rooms are as good as those on the second floor.

The eaves and gable rafters project thirty inches from the wall-line. This heavy projection, whilst taking away the meagre look which small projections give, serves many other purposes: first, it throws the water away from the walls and protects them from the weather; it also shelters the upper part of the chamber windows, the greater number of which are casements.

The general plan of the cottage, to which considerable thought was given, had to be, primarily, an economical arrangement, suitable to the requirements of the family and the site. We did not require a great number of rooms, nor did we need these connected by wide openings, so that, as is customary, the whole of the ground-floor could be thrown into one room. The widest door opening is that

from the hall into the parlor, and this is only four feet wide — ample enough for all practical purposes.

The rooms, in form, are generally that of a parallelogram, and their proportion has been carefully considered so far as other things would allow. The parlor is twenty-three feet long by twelve and one-half feet wide, increased at the bay-window to fifteen feet, the bay being eleven feet by two feet six inches. The dining-room is fifteen feet by twelve feet. Own chamber over parlor is twenty-two feet long by twelve feet ten inches, exclusive of the bay-window.

The hall upstairs, which extends over the porch, forms a room fourteen feet ten inches by eleven feet ten inches in size, which we have made a library — a room where the family can gather round the table in the evening and be undisturbed by any one coming in.

There are no "back stairs" in this house, a considerable amount of space being thus saved.

The staircase is continued up to the attic-floor in just the same style, size, etc., as the lower part.

The staircase, library, own chamber, bath-room, guest-chamber, and the two closets to the north have casement sashes, mostly glazed with leaded glass, all hinged at the sides to open outwards, and having mosquito wire screens inside, hinged to open inwards. The five lights in bay-window of own chamber have oval medallion forms with pale-green antique glass; the central three of these have figure subjects painted after Henry Holiday, representing architecture, painting, and sculpture.

The small casements in the chamber-closets give good ventilation and light. The first story is nine feet from floor to ceiling; the second story and attic are each eight feet six inches in height.

The main part of the house is twenty-four feet wide by forty-three feet deep, and on the lot, which is sixty feet wide, the house stands near the eastern boundary. The kitchen is placed at the northeast corner, and on the eastern side there are few windows, and these of moderate size.

The parlor, facing the south and with one end to the west, has the sun all day, while the shadiness of the porch is extended by an awning which covers from the arch outwards to the corner of the dining-room.

The interior of the house is not entirely finished, that is to say, there is some decorative work to be added later on. The woodwork in the parlor is painted white. There is a dado formed by painting the plaster white for twenty-four inches in height, with small wood capping and base. Above this the walls are papered with a light cream-colored paper, — a French design, — reproduced by a New York firm of manufacturers. The cornice of the room is of wood painted white, and under this is a frieze eight inches deep formed by painting in oil a light salmon-color with garlands stencilled on in cream-white. This will be replaced by a frieze of modelled canvas, — designed and made by an old friend, Mr. Wm. Scott Morton, of Edinburgh. The ceiling has a pale tint of a celery-green color in water-color. The mantel is of wood, and the fireplace has yellow Sienna marble facings with fireback and jambs of bronze.

The hall and staircase are of oak on the ground-floor, and cypress in the library. The hall has a dado thirty-six inches high. All the woodwork is stained a moderately deep brown color, and the walls are painted in oil a Pompeiian red color. The ceilings are yellowish in water-color.

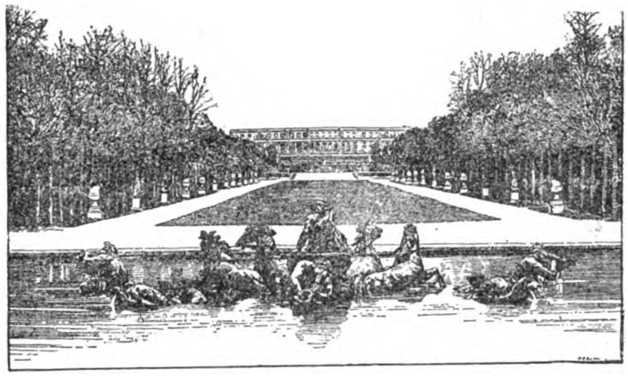
The dining-room is wainscotted to a height of five feet six inches in oak, the dado capping stepping up and over the door and window-heads. The oak is stained a very pleasing brown color, about the depth of English brown oak, and finished with a dead polish. The plaster-surface of the walls above the wainscotting about thirty-six inches to the cornice is at present painted a greenish-blue color. This space will be filled-in by-and-by with coarse canvas painted in colors, from the architect's design, forming a deep rich frieze to the room. As the colors will be flatted with turpentine, the effect will resemble tapestry. Fruit and flowers conventionally treated will form the subject.

The ceiling, at present tinted Indian-yellow, will ultimately be divided into panels by moulded wood ribs with applied ornaments in centre of the panels in which the thistle, Tudor rose, three interlacing moons, and other ornaments will be represented. The fireplace in this room is of red cement, made by Lascelles & Co., of London, from a design by Mr. R. Norman Shaw, the architect.

On the second floor the woodwork of all the chambers is painted white. In own chamber the fireplace end is panelled the whole width and height of the room, forming two closets, one at each side of the chimney-breast. The fireplace has blue-and-white Dutch tiles and a "hob" grate.

BRONZE. — The Italian *bronzo* has been usually traced to the low Latin *brunitus*, meaning brown; but the eminent French chemist, M. Berthelot, in the *Revue des Deux Mondes* (September 1, page 47), shows it to be derived from the place name, Brundisium, now Brindisi. An eighth-century manuscript, "Compositiones ad Tingenda," preserved in the Canons' Library at Lucca, gives a recipe for making *brundisium*, — that is to say, bronze, — and the details show that the alloy was fabricated at Brindisi for the mirrors mentioned by Pliny. *Æs brundisium* became *brunitium*, *bruntium*, and, lastly, *bronzo*, just as *æs cyprium* became *copper*. The manuscript is given, but apparently with mutilations and misprints, in Muratori's "*Antiquitates Italicæ*," II. 386. — *Notes and Queries.*

BURNED CLAY AS ROOFING MATERIAL.[1]



The Palace from the Bassin d'Apollon, Versailles. From "*La France Artistique et Monumentale.*"

UNDER the head of Burned Clay as a Roofing Material, the word "tile" expresses the material it is made of, how it is made, and its uses. The *Century Dictionary* defines the word "tile" as a thin slab of baked clay used for covering the roofs of buildings, etc. A thin slab of tin, iron, or metal of any kind is not tile. Tile is burned clay as a roofing material, and nothing else, and that is what I want to occupy your attention with for a few minutes.

Edward S. Morse published a series of articles in the *American Architect*, in 1892, on "The Older Form of Roofing Tiles," that are exhaustive in tracing their history. He traces their use back to China, several thousand years before Christ, and says they were made even before the sloping roof was first used. Palm-leaves, straw, and the bark of trees formed the first coverings for sloping roofs, and then comes terra-cotta tile made in the form of bark, with the larger pieces curving upward, and smaller pieces to cover the joints. Relics of these ancient tiles are found in the art galleries in Berlin, Dresden, and London. The articles are illustrated with cuts of tiles made in different countries, and it is a remarkable fact that tiles are made and used in this country to-day of the same general form that were used four thousand years ago.

In his classification, Mr. Morse shows that the normal (Asiatic) tiles were used in the Orient, Ancient Greece and Italy, China, India, Greece and Italy; the pan (Belgic), in England, Scandinavia, Belgium, Holland, Japan, Java, and various modern countries; the flat (Germanic), in Germany, Austria, Hungary, Poland, Switzerland, France and England.

In the shape and form of these tiles you will see the same shapes and forms most generally used to-day, both in Europe and America. It is shown that these old forms of tile are bedded in mud and clay; it is necessary in laying most of the tiles made at this day to bed them in cement. The most artistic tiles are found in China, Korea, and Japan, where they are highly glazed in different colors, with very elaborate finishings, making a very showy and ornamental roof.

The old form of tile was made of material the most enduring of man's fabrications, and the terra-cotta roof-tile, when properly made, is, all things considered, one of the cheapest and most durable. Acting as a non-conductor, the upper portion of the house, under a tile roof, is warm in winter and cool in summer. Slate absorbs and transmits a great deal of heat. Shingles are short-lived, and a menace in times of conflagration. With the best tile clays in the world, and an abundance of the unskilled labor usually employed in making tile, there is no reason why roofing-tiles should not come into common use in this country, as they have in all other parts of the world. These are the conclusions of Mr. Morse, after an exhaustive investigation of tile-roofing — I must say that I fully agree with him.

In the "*Encyclpédie de l' Architecture et de la Construction,*" A. Rospide has an article on "Roofing-tile in France," which gives a good description of the latest improvements. He divides his article on "Roofing Material" into four parts: first, clay; second, stone; third, metallic; and fourth, wood; giving the preference in the order named. In speaking of the manufacture of tile, he says it is still carried on just as it was before the development of machinery. The clay must be selected with great care, reduced to a paste, run into a plaster mould, then dried and burned. This necessarily makes the tile thick, and requires a great deal of trimming and handling. The simple flat tile was long ago almost universally superseded by the lapping and interlocking tile. He says the following are requisites of every good roofing material:

1. It must exclude moisture, which rots wooden framework.
2. It must be capable of withstanding the force of the wind, and must admit of provision for all expansion and contraction consequent upon variations in temperature.
3. It must not overweight the trussing so as to increase the size of the supporting timbers.
4. It must be fireproof.
5. The original expense should be consistent with the purpose which the construction is to serve.
6. It should require but little care.

[1] Paper read before the National Brickmakers' Association at Louisville, Ky., January 26, 1893. By John R. Elder, President of Clay Shingle Co., Indianapolis, Ind.

Every one of these conditions is fully complied with by the tile made under the patents of the Clay Shingle Company.

Louis H. Gibson, architect, spent years in France and Germany investigating their manner of building, especially in constructing their houses so as to be secure from fire. He speaks in no uncertain way about burnt clay for covering houses. It is the ideal covering — the only material that is reliable, and will stand the test for centuries. He says:

"The arguments in favor of a tile roof are too old and too numerous to need anything more than mere mention. If we stop to think about it, we know that the roofing material in general use is far from satisfactory. Slate, at best, is a temporary roofing; it is readily affected by heat; so much so, indeed, that a little heat will expose all of the woodwork of an ordinary roof to the action of fire. Shingles are as inflammable as it is possible to arrange the same amount of wood. Slate and shingles, as we know, are the general roofing materials. Tile, being a clay product, affords protection to all woodwork under it in a perfectly satisfactory way. The heat does not affect the tiles in the least. Frost affects them much less than slate. The covering of a roof with tile practically means not only the protection from the elements, but, as well, protection from conflagrations, or any unusual or dangerous degree of heat. Heat, as we know, cannot affect burned-clay products. This quality, together with its ability to resist other elements of nature, renders it the ideal building material. Its qualities of this character are quite as apparent for roof-covering as for other use. For some reason, not easily understood, tile roofs have not been generally manufactured in America. While the field is open, and while there is a general demand for the material, it is not satisfied. There is a difficulty in securing a satisfactory tile roof at a moderate price.

"For the purpose of demonstrating the real value of tile roof, I choose to go back to their history in France. There are many roofs existing in this country which are not quite one thousand years old, and those of the tenth and eleventh centuries are common indeed. What better evidence of their quality can be asked?"

In the western part of Indiana, in a small country town, lives a very intelligent old gentleman. He is a carpenter, and supports himself and family by work at his trade. He had travelled very little; his business did not allow him much time for reading, but he was a great thinker. He had an inventive mind, and understood the use of tools. As there were excellent clays in his town, he tried to form a tile for roofing houses. He spent all his spare time and money for years in experimenting. The forms he made were burned in a fire-brick factory near. When he had got a good point he kept it, and changed and altered and improved until he succeeded in getting what he believed to be just the thing. He wanted a tile that would be stong, light on the roof, that would be guarded at every point against sleet, rain, and drifting snow; that would be wind, water and frost proof, and fireproof; that could be made by machinery at a small expense, and could be worked and burned without loss. After getting all these points to his satisfaction, he consulted a patent attorney and found his form and principle were new — that his tile was patentable. He secured one patent, and followed that with others, until he now has six. Like most inventors, he had no money to manufacture his tile. He had neither money nor influence to seek the capital necessary. After several years the president of the railroad running through his town became interested in his invention, and through his influence the necessary capital was obtained. A factory was started. Again time and money were spent in putting his theories into practical use. Tile was made, the factory was run successfully and profitably, and to-day some splendid buildings are covered with tile made at his little factory. He can show roofs equal to any in the world. Unfortunately, the factory burned, and has not yet been rebuilt, but four factories are now at work in different parts of the country, and before this year is out more tile will be made of his pattern, and under his patents, than in all the other tile factories in the United States.

Architects and others often wonder why more tile has not been used in the United States. This question is easily answered: In the first place, this was a timber country; clapboards and shingles were easily made out of timber, and they formed a cheap roof that answered the purpose for a time. Then came slate, and tin, and galvanized-iron, and felt, and gravel, that could always be obtained when wanted, were light and cheap. Tile, as made, was heavy, expensive, hard to get, and in consequence was only used on expensive buildings, that could contract for them in ample time. Many have tried to make tile, but the rule has been to follow the old forms of tile, and the old manner of making them, so that there was no profit in it. Both Mr. Morse and M. Rospide, quoted above, confirm this fact. The manufacture of tile has not kept pace in advancement with that of any other branch of clay industry. The idea has been to invent a machine to make tile easily and cheaply, while the fact is, there is plenty of machinery exactly suited for the purpose. The brick-presses of to-day can make tile just as easily as they can make brick, and the best of these are not expensive. I would not consider a repress expensive that will make 4,000 tiles a day, and cost but $225. The German press that forms the tile in plaster moulds is not what progressive Americans want. The application of our improved machinery in preparing clay, and forming tile, is a long step in the direction of increasing the use of tiles, improving their quality, and cheapening their cost.

So far as I have been able to learn, there are only five tile-works in the United States. Three of these are in Baltimore and two in Ohio. Terra-cotta works have made tile on orders, but it is a branch they have not prepared for, and only make them when they feel compelled to. There are more tiles made by one factory in Ohio than by all the balance in the United States. This fact would indicate that making roofing-tile has not been profitable in this country; and this is probably true, as we find where any business is successful competition starts up all around it. In our opinion, the the reason the tile business has not been more successful is because the old form of tile, and the way of making them in the old country, has been followed in this. The tile is too heavy, has to be laid in cement, and the improved machinery has not been used in making them. And, again, stocks have never been kept on hand to fill orders on short notice. When you think of the vast sums that are spent each year in buildings, and that fully one-twentieth of the cost of all these buildings is for the roofs, you can see what a business can be done if the tile can be had at a reasonable price.

In speaking of the tile-factories above, I did not include four that have been started within the last year to make tile under the patents of the Clay Shingle Company. One factory has been started at Baltimore, one at Trenton, N. J., one at Chicago, and one at Denver. Before this year is out all these factories will be making tile on a large scale, and negotiations are now pending for several other factories.

In considering the value of roofing-tile, the question of protection from fire, and insurance, enters largely into the account. In these days, when so much money is spent in fireproofing the inside of buildings with hollow-brick walls, deadening the floors with terra-cotta blocks, and steel joists and girders, it seems like folly to put materials on a roof, the most exposed part of the building, that will not resist the least heat, but rather attracts fire from adjoining buildings, and often when more than a square away. Many of you have had fires, and know what it means to be burned out; and all of you pay insurance, and know what a heavy tax that is. In Germany, where buildings are constructed under government inspection, with all possible protection against fire, and where tile roofs are universal, the rate of insurance is one-tenth of what it is in this country. A risk that will cost one dollar there will cost ten dollars here, and losses by fire there are as one to one hundred here. In the last seventeen years, in the United States, the losses by fire were $1,818,323,306 — more than the present National debt. In the year 1891 the loss was $143,764,967, in 23,313 fires. In these fires, 44 brick and tile works were destroyed; 981 fires were caused by sparks from locomotives and flues, on which the loss was $4,506,-184; 12,394 business failures were traced directly to the loss by fires in 1891. Last year, $40,600,000 of property was destroyed by fire that did not originate on the premises or by exposure to adjoining property. The percentage of loss in 1891 that originated on the premises was 71.8, and by exposure, 28.2. This is a fearful record of loss by fire, and, the worst of it is, every one of you have to pay part of it, whether your property was insured or not. This is only the money value of the loss, and if the loss in time and business, by men thrown out of work, were estimated, it would probably be more than doubled. Now, as it is an admitted and unquestioned fact that there is no material that affords so certain a protection from fire as burned clay, you see the value tile has for roofing. Nearly one-third the fires and one-third the loss in 1891 were from outside exposures, that might and would have been saved if the buildings had been covered with tile. Can any stronger argument be used in favor of covering houses with tile?

Another valuable quality in the clay roof-covering is that it is a non-conductor. This is evidenced by the use of porcelain insulators on electric lines. They are considered just as good for this purpose as glass. Now it is as important in building a house to keep out the heat in summer as to keep it in in winter. It is the rule that the attics of our houses, and especially if covered with slate, are as hot as ovens; and as long as a single floor and coat of plaster only separate the attic from the sleeping-room, the temperature in the latter nearly equals that of the former. Nothing so effectually overcomes this as a tile roof, which neither attracts the heat nor retains the frost. The sleeping-rooms in a house covered with tile are always comfortable — cooler in summer and warmer in winter.

The day for boring auger-holes with gimlets is passed. In all mechanical business, and particularly in clay industries, in these days, it takes capital to start a business and carry it on. The profit is made to-day on the amount of business done — on the use of the best machinery and appliances, and conveniences for handling and shipping. Little fish can't swim safely in streams where big fish live and thrive. The point I want to make is, that to be successful in any branch of the clay business, in these days, you must have money enough to get the best machinery and to meet all bills until your business gets on a paying basis. This is particularly true in the tile business. Many have the idea that the roofing-tile business is a small one — that it is like the drain-tile business, a neighborhood affair. It is not. It is a business as large as you have the money and business brains to make it. No tile-factory I know of in this country has been able to keep a stock on hand to supply immediate demands. It has been necessary to order the tile for the roof before the cellar was dug, and then often wait weeks or months, with the building exposed to the weather, before you got them.

The consequence of this uncertainty and delay has compelled architects and owners to substitute other roof-covering — they would not be deviled to death waiting. Tile will stand shipping; the business is a large and growing one, but it must not be started and carried-on on the gimlet principle.

You have read in your papers of the trials and tribulations of the man who tried to run a brick-yard. He had read about making brick in the papers, and therefore knew all about it. All he had to do was to buy a machine, start a yard, and the machine would make the brick. He tells of his troubles: the time lost, money lost, brick lost, temper lost, and even his religion lost, before he succeeded in becoming a good brick-maker. If this is true of brick, it is doubly true of tile. It is possible some of you have had experience in trying to make tile, and could tell interesting stories of how sanguine you were when you started in, and how disgusted you were when you started out. If you have not been there, others have. I have met them — plenty of them. I have heard of men who could tell you all about making tile — but their tile never got on the roof. I suppose I am talking to practical men, who can appreciate a practical business proposition. When I tell you that if you want to start in the tile business buy experience and knowledge from the successful man you will understand it. If the knowledge is of the right kind, it is cheap at any price. It will save you much more than you pay for it. Experimenting costs a great deal more than practical knowledge and experience. The man that has the knowledge and experience has paid for it. You see the point?

Will tiles sell? is a question that may be asked. I have been in a position to know they will. Of course, tile, as compared to other roofs, is not a cheap roof, and will not be used on the cheaper class of buildings. But tile has qualities for roofing no other material has, and if a tile looks well, has the fire and frost properties, can be laid at a small cost, is not too heavy, and can be sold at a reasonable price, every building that has valuable records and property to protect — churches, school-houses, railroad depots, and elegant private residences — will use it. The trouble is not to sell tiles, but to have them to sell, so that architects and builders know they can get them, when wanted, without delay. I know what I am saying when I tell you the only trouble about selling tile is in keeping a stock on hand to supply the demand. Tile is the coming roof in the United States.

I have shown you, from the best authority, that there is no roofing material which equals tile. Slate is the next best, and in comparing prices with an inferior article you must bear in mind the relative qualities. The *American Architect* quotes prices on building materials. In looking at the quotations on slate, in Chicago, to builders and contractors, the prices range from \$5.50 to \$14 per square. Red slate is \$12 to \$14, and unfading black and purple, \$7.10 to \$9.00. Now the tiles made under the patents of the Clay Shingle Company can be sold, at a good profit, for \$8.00 per square, and can be laid on the roof as cheap as, or cheaper than, slate; so you see the modern tile, made by machinery, having all the valuable qualities of the old tile, has the advantage in weight and price over the better class of slate. With these points in its favor, who can say that tile is not the coming roof?

SOCIETIES

REPORT

THE PHILADELPHIA T-SQUARE CLUB.

THE Philadelphia T-Square Club met on Wednesday, January 18. The subject for the evening was — "A full-size detail of a Carved Panel in the Italian Renaissance style." The first mention was awarded to George B. Page, the second to Adin B. Lacey, and the third to Percy Ash. The Secretary reported that the Club Exhibit at the Columbian Exposition comprised designs by the following members: Arthur Truscott, J. J. Bissegger, James P. Jamieson, Adin B Lacey, Percy Ash, Edward T. Boggs, Charles Z. Klauder, John J. Dull, James H. Cook, Louis C. Hickman, A. C. Munoz. The subject for the next competition, due February 17, was announced: Pen-and-ink Rendering from a Photograph of Ann Hathaway's Cottage. PERCY ASH, *Secretary.*

ILLUSTRATIONS

[*Contributors are requested to send with their drawings full and adequate descriptions of the buildings, including a statement of cost.*]

OLD HOUSES, FRONT STREET, HARRISBURG, PA.

[Gelatine Print issued with the International and Imperial Editions only.]

THE NEWTON CLUB-HOUSE, NEWTON, MASS. MESSRS. HARTWELL & RICHARDSON, ARCHITECTS, BOSTON, MASS.

COMPETITIVE DESIGN FOR THE NEWTON CLUB-HOUSE, NEWTON, MASS. MR. S. J. BROWN, ARCHITECT, BOSTON, MASS.

ANOTHER design submitted in the same competition was published in our issue for August 15, 1891.

HOUSE OF MR. ROBERT BROWN, JR., ARCHITECT, DORCHESTER, MASS.

FOR description, see article elsewhere in this issue.

[Additional Illustrations in the International Edition.]

FOUNTAIN AT FONTENAY-LE-COMTE, FRANCE. RESTORATION BY M. LIBAUDIERE, ARCHITECT.

[Three Copper-plate Photogravures.]

THE great fountain at Fontenay-le-Comte is curious to study because of the wide elliptical arch, which is introduced between the archivolt and the frieze of the surmounting pediment in such a fashion that the design introduces three architraves where there need be but one. Whatever of agreeability the fountain has is due to the treatment of the inner wall with its strong arcades and panelling.

THE IMPERIAL INSTITUTE, SOUTH KENSINGTON, ENG.

WE published a view on a large scale, two portions, of Mr. Collcutt's design for the Imperial Institute after the competition. It will be interesting to compare it with the photographic views of the parts of the building which we publish to-day. For it will be seen that the architect has made alterations in detail, and the pains which have been taken suggest one of the causes of Mr. Collcutt's success. The sculpture, which was an element of the design, has yet to be introduced, but, in spite of its absence, the building may be pointed to as a sign that architecture still is a living art in England.

DETAIL OF THE SAME.

THE HISTORY OF JOAN OF ARC.

WHEN it was decided to have the walls of the Panthéon in Paris painted by the foremost artists in France, the intention was to illustrate the history or legends of St. Geneviève, to whom the building was dedicated at the time. Soon afterwards the painters were allowed to have more scope in the selection of the subjects. If M. Puvis de Chavannes and M. Jean Paul Laurens kept to the traditions of the patroness of Paris, who lived in the fifth century, M. Lévy selected Charlemagne, the restorer of order in the eighth century, as his subject, while M. Cabanel depicted scenes in the life of St. Louis, the representative king of the thirteenth century. The illustration we publish this week shows that M. Lenepveu has taken events of a later period, that is, the tragedy of Jeanne d'Arc, of which the final scene was gone through in 1431. Far apart as were the transactions which are represented in the Panthéon, most of them unite in revealing the power which faith in the unseen exercised at different times among the French people. Geneviève, Charlemagne, Louis and Jeanne were alike confident that they were inspired to undertake most difficult duties, and were to have more than human help to support them against their opponents.

M. Lenepveu in his paintings is careful to suggest a condition of mind in Joan which may be called ecstatic, and is exhibited in three states. The pained expression which denotes her great fear when the mysterious voices were heard ("*et primâ voce habuit magnum timorem*") is contrasted with the satisfaction which was felt when Charles was crowned, and with the hope that afterwards was able to overcome the terrors of the martyrdom. It must be said that of late years French artists are rather indifferent to the portrayal of emotions, and many of them would have painted a similar series of scenes without troubling themselves about the manner in which Joan's features were moved by her feelings. M. Lenepveu is so thorough in his method he could not pass lightly over any detail, and as he has spared no pains to be exact in costume and accessories, he has likewise endeavored to reveal to his countrymen not only the appearance of the peasant-girl in the periods of inspiration, struggle, triumph and martyrdom, but also the enthusiasm by which deeds were accomplished which were a puzzle to her contemporaries and are incomprehensible to people of a later time.

Political events have of late years surrounded the memory of Joan of Arc with a novel interest. As she was born in Domremy, which is in the valley of the Meuse in Lorraine, Joan has been accepted as representing the grief which has made many Alsatian women wear black, and the desire to revenge the losses of the last war which prevails among Frenchmen. Accordingly an equestrian figure of Joan has been set up in Nancy, and she is represented as if leading her countrymen towards the captured provinces. If the morals of the heroine of Orleans were no better than those of Mdlle. Théroigne, who led the women of Paris to Versailles and captured the cannon of Louis XVI (she also had her martyrdom, for she was driven mad

through a fustigation by her countrywomen), Joan would still be accepted as the genius of militant patriotism. Many of the people who lay wreaths on the figures of Joan in Paris and Nancy may be as sceptical about her virtues as was the Bishop of Beauvais, or Monstrelet, or Voltaire, or the author of the first part of "King Henry VI." Are they to be blamed? In a case where so much is doubtful we must tolerate many interpretations. The more the circumstances are investigated the more difficult is it to draw a conclusion.

With the evidence relating to the astonishing events which occurred in France before him, a man is likely to judge of the character of Joan of Arc according to his own idiosyncrasy, and make the history serve any theory he may wish to set up. Thus it is that M. Marin, after an exhaustive study of the contests, concludes that Joan was possessed of military genius. Herr Mahrenholz, on the other hand, maintains that all she performed was dictated by an inferior officer. M. Lesigne concludes, after his researches, that Joan was not consumed in Rouen, but married a noble and brought up a large family in happiness. M. Siméon Luce believes she was an agent of the Franciscans, while M. Chapotin asserts that she was controlled by the rival order, the Dominicans. If the history related to an earlier time and a different country, it would be called mythic. It would be well if the darkness were more generally accepted by the French. It now suits them to utilize the fame of Joan of Arc as if she were an Alsatian in revolt. At another time she may be turned to account against the English, who are supposed to have been her executioners. Yet, if there is any truth in the records, her most bitter enemies were Frenchmen.

It would be out of place to attempt here any new theory on the subject, but a few notes may be given from the records of Joan's trial (they have been reprinted in five volumes, with notes by M. Jules Quicherat) and other sources, which will help to explain M. Lenepveu's series of paintings.

Joan was born on the festival of the Epiphany in 1412, and was the child of Jacques d'Arc and Isabelle Rommée, who were peasants. According to Michelet, her Christian name was really Jean, after the Evangelist, and because a descendant of her brother in 1612 called himself Darc some assume that was the surname. The Dukes of Lorraine, including the little village of Domremy, were generally found among the allies of the French kings when they were at war, but at other times the Dukes fought against France. In the beginning of the fifteenth century, Lorraine, although surrounded by English and Burgundian troops, was faithful to the House of Valois, that then was nearly overthrown. The battle of Agincourt was fought in 1415, that is, when Joan was three years old. Charles VI, who was driven mad by his calamities, died in 1422. His successor, the Dauphin, was not the kind of ruler that could rescue France from the English troops. The reality was terrible. Intelligence of the defeats, we suppose, reached Domremy in an exaggerated form, and could hardly fail to excite an impressionable girl like Jeanne d'Arc. Her parents' cottage was near the village church, as is seen in the painting. The sounds of the bells gave her extreme pleasure. There was also a remarkable beech-tree beside her home, which was supposed to be in some way connected with the fairies, and it was referred to at her trial as a scene of superstitious acts on her part. Joan occasionally kept her father's sheep, but most of her time was spent inside the house. M. Lenepveu represents her as holding a distaff, for, when describing her youth, she declared before her judges that she was not afraid of competing in spinning and sewing with any of the women of Rouen ("*nec timebat mulierem Rothomagensem de nendo et suendo*").

It was in her thirteenth year that Joan appears to have had the first of her mysterious manifestations. On her right side a light arose, and a voice advised her to be good, and to frequent the church, and also announced that she was at a future time to visit France. Subsequently St. Michael appeared, as is represented in the painting, and informed Joan that St. Catherine and St. Margaret, who are shown above, were to be her guides. These visions continued for four years, and she was silent concerning them. It was testified that in no way was she made vain by them. In 1429 she was told the time for the delivery of France had arrived, that she was to visit the Dauphin at Chinon, and ask for troops to raise the siege of Orleans. When she expressed fear, it was said that if Sir Robert de Baudricourt were applied to he would give her an escort to bring her to Charles.

Accompanied by her uncle, she went to Baudricourt, who had Joan exorcised. Then she was sent to Nancy, to the Duke of Lorraine. Eventually she found her way to the Court at Chinon. The story about her recognition of Charles amidst a crowd is well known. De Quincey considers the whole affair was a mere trick of legerdemain, such as may be seen any day for a shilling, and he says he was surprised to hear Southey owning a secret bias in favor of Joan, founded on the detection of the Prince. Prejudiced as was the writer of "Henry VI," he took a more worthy view of the transaction, and it would appear from the evidence at the trial that there was no collusion at Chinon. Besides, Joan was sent to Poitiers, and there for three weeks was subjected to all the examinations which were supposed to be efficacious in detecting impostors. The reports of the inquiry at Poitiers are lost; but as Joan at her trial repeatedly referred to them, they must have been in her favor. The ecclesiastics decided that the Dauphin might lawfully employ her services. Charles gave her a suit of armor; from the Duke of Alençon she obtained a black war-horse. For the sword she ordered a search to be made in the church of St. Catherine at Fierbois. The banner was made according to instructions given by the voices. It was of white linen, on which images of Christ and the Blessed Virgin were painted, with the crown and lilies of France. M. Lenepveu follows these details. The banner seemed to exalt her spirit; with it in her hand she rode about the camp at Chinon. In "Henry VI" Joan professes to be changed in appearance after one of her visions:

> And whereas I was black and swart before,
> With those clear rays which she infused on me
> That beauty I am bless'd with which you see.

The lines express the tradition as it was known after a couple of centuries; but, according to the evidence, Joan was swart, short, and active, — "*erat brevi quidem staturâ, rusticanâ facie et nigro capillo, et toto corpore prævalida*," — the sort of girl that was to be seen in many peasants' cottages. She was not, however, unfeminine, for, like Cordelia, her voice was soft, gentle, and low, — *vocem mulieris habet ad instar gracilem*," — and to the youths in the army she seemed to be something divine.

Joan appeared before Orleans on April 12, 1429. Lingard, who believes she was the victim of a delusion which, however, nerved and elevated her mind, says that care was taken by the French to communicate her history with due exaggeration to the English who were besieging the city. The men concluded she was either an impostor or a sorceress, and became as afraid of one as of the other. There were two tasks before the French. The first was to throw supplies into Orleans, where there was famine, an operation that was successful, apparently without loss of life, owing to the terror which Joan's name inspired. The second was to compel the English to depart. Joan's tactics, as described by herself at her trial, were very simple. "I told the soldiers," she said, "to boldly enter among the English troops, and I also entered boldly." About sixty-temporary fortifications had to be conquered, and there were ten days of fighting before the siege was raised. Talbot and Suffolk invited a renewal of the contest outside the walls, but Joan would not allow the French troops to leave Orleans. The victory was completed on Sunday, and she said, "*En nom Dieu, laissez-les partir, et allons rendre grâces à Dieu.*" How much the presence of Joan contributed to the triumph is seen from the letter of the Duke of Bedford, who was the English regent. "The courage of the soldiers," he wrote, "was shaken by lack of belief and the unlawful doubt of a disciple and limb of the fiend, called the Pucelle, who used false enchantments and sorcery,"

The rescue of Orleans was the flood in the tide which, rightly taken, would lead to fortune. Joan of Arc, whose mission was to see the Dauphin crowned at Rheims, was eager to follow up the victory, but for a time Charles was dilatory. At length Joan's advice was followed. Jargeau, Mehun, Baugeny, and Patay were attacked and taken. On July 14, 1429, Rheims was entered.

On the next day, which was Sunday, Charles was consecrated in the cathedral. Most historians relate that, as soon as the ceremony was over, she threw herself on her knees before the king, embraced his feet, declared her mission accomplished, and with tears solicited his leave to return to her former station. But the evidence at the trial does not recall a scene of that kind. Nor is Schiller's treatment more warranted, for, according to Carlyle's abstract, "Amid the tumult and magnificence of this royal pageant she sinks into a reverie; her small native dale of Arc, between its quiet hills, rises on her mind's eye, with its straw-roofed huts and its clear green sward, where the sun is even then shining so brightly, and the sky is so blue and all is so calm and motherly and safe. She sighs for the peace of that sequestered home; then shudders to think that she shall never see it more." M. Lenepveu is more true to the depositions when he represents Joan as standing firmly while she offers her thanksgiving for what is past, and resolute to meet the future. She is not exhausted, and appears to feel that her task is not accomplished while an English soldier remains in France. That in the course of the day she talked about death with the Archbishop was only natural with a girl whose visions did not reveal her own fate.

Enthusiasm is rarely of long duration among soldiers, and it is not surprising that the officers soon after the coronation began to treat poor Joan as one of the worst amateurs. She was not consulted about movements, but when failure occurred she bore the blame. At last at Compiègne, in May, 1430, she was deserted, and taken prisoner by John of Luxembourg, who was a Burgundian. Then came the turn of the men of peace. Whether inspired by heaven or hell, she was an exceptional subject, and it was the business of science to endeavor to discover the complicated movements which produced such remarkable effects. Theologians, metaphysicians, moral philosophers, devil's advocates, were all eager to take part in the analysis of the heroic girl's mind. The University of Paris, that claimed a sort of monopoly of the most interesting victims, lost no time in applying for the possession of Joan. But the operators were not trusted by the Burgundians and their allies, for Joan in Paris might obtain the benefit of a doubt. The English, too, were anxious that their defeat might be explained by the influence of infernal powers, and for that end it was only necessary to make Joan out a sorceress. There was no difficulty in finding an agent. When Beauvais fell into the hands of the new king whom Joan helped to

create, Pierre Cauchon, who favored the Burgundians, was deprived of his bishopric. He fled to England and became an adherent of the House of Lancaster. The archbishopric of Rouen was promised to him. It happened that the spot where Joan was captured was near the boundary of the diocese of Beauvais. Cauchon accordingly claimed jurisdiction over her; Henry VI of England also set up a claim on the prisoner. Eventually she was delivered and brought in chains to Rouen. The trial went on during four months. The Bishop of Beauvais presided, and he had the help of forty-two assessors, who represented moral theology, canon-law, and civil law. Joan was examined during five days in court and six days in prison. In a contest with dialecticians she could hardly expect to succeed, but her inconsistencies are not of account. The answers were analyzed, and twelve propositions made out of them were submitted to the University of Paris. The assessors, we suppose, were associated with that learned body. At any rate, no time was lost by the University in condemning the propositions as blasphemous and heretical. On Whit Monday, in 1431, Joan was doomed to death for apostasy and sorcery.

Savonarola lost his prophet's strength under torture and signed a confession of guilt. Is it surprising that Joan of Arc should also reveal a human weakness, and when she thought of the fire that awaited her should lose confidence in her inspiration? She signed a retractation, and her punishment was changed to imprisonment for life. For some reason, that remains unexplained, she ceased to be a prisoner of the Church, and was handed over to the English authorities. Then came a revulsion of feeling. Once more the memory of the spirit voices overcame her, and she was filled with remorse at her disloyalty to her guides. Joan spoke about her divine inspiration, and as all her words were noted, information of the change was brought to her judge. The words might easily have been interpreted as the result of delirium brought about by her sufferings, but State policy made it necessary that Joan should pass from life as a being that was less than human.

The last scene of all has been depicted by M. Lenepveu with rigorous exactness. The judges were present, but their formalities on such an occasion were observed with impatience by the soldiers, who asked if they were to be kept waiting until dinner-time. The employment of a soldier to carry faggots and the raised arms of others suggest that there was a stain on the army which could only be removed by a fire like that which was about to be lighted. No cross was allowed to be borne by Joan, but a soldier, out of pity, broke a staff in two, tied the parts together, and gave them to her. She held it, but begged for a crucifix. The scaffold was made higher than usual, in order that all might see whether the executioner was merciful and allowed the culprit to be smothered. In Joan's case there was to be no abridgement of the torture. It is satisfactory to learn that the consolation of believing in heavenly guidance came back in that supreme hour with stronger power. She could be considerate for the monk who brought her the crucifix, and implored him to descend before he suffered through his humanity. It must be admitted that not much was gained by her execution. The power of England was not made more enduring by her absence from France. But it must be admitted that throughout the proceedings there was a regularity which was not always witnessed in State trials. The judges acted according to their lights, and for many a year afterwards in Europe and America unhappy women were burnt whose guilt appeared less manifest than that of the peasant-girl of Domremy. If M. Lenepveu's paintings will teach all who look on them to be tolerant to genuine enthusiasm in every form, the Panthéon may still be taken as a place of wise counsel.

COMMUNICATIONS

[*The editors cannot pay attention to demands of correspondents who forget to give their names and addresses as guaranty of good faith; nor do they hold themselves responsible for opinions expressed by their correspondents.*]

THE LEAGUE EXHIBITION.

PHILADELPHIA, PA., January 23, 1893.

To the Editors of the American Architect:—

Dear Sirs,—I do not wish to appear captious or to meddle in what is none of my affair, but I cannot help saying that I was disappointed in the notice of the Architectural League Exhibition in the *American Architect*, now being held in New York. The fact is that I received a much more just impression of the Exhibition from the daily papers than from the *Architect* itself. This latter account is enough to deter any one from taking any trouble to visit the League this year, but as it only appeared in Saturday's edition and as the Exhibition closes to-morrow it can have but little effect on the number of visitors. Fortunately for me, I had been to the Fine Arts Society building a week ago and since then have returned twice, each time more thoroughly convinced that there were more objects worthy of study, from the magnificent three-quarter-scale drawings of the Madison Square Garden and the Century Club to the fanciful frieze of Walter Crane, so admirable in its scholarly restraint, than I had ever had the luck to see in any League Exhibition.

As to your correspondent's comment that the rooms are too fine for the drawings shown in them,—most people, I think, prefer looking at pictures in five convenient and well-lighted rooms to seeing the same number crowded into two rooms and a dark entry, as used to be the case.

Of course this letter is not for publication unless it might chance to be of any use to you, and I hope you won't think it ill-natured.

Yours truly, John Stewardson.

[We are glad to get such a letter as this, and we publish it, to show other people the kind of letters that we like, and that are really serviceable to us, and, we hope, to our readers. The fact is, that, although we really found this year's exhibition rather lacking in conspicuous attractions, like the Exposition drawings last year, and the Cathedral competition designs a year or two before, we found it, as we always do, very interesting in detail, and prepared, as usual, notes on the greater part of the works shown, when it occurred to us that perhaps the long and minute accounts which we have generally given of the works exhibited were more suited to our taste than to other people's, and that it was quite possible that they might be a decided bore to our readers. This idea grew upon us so far that we concluded, in deference to it, to cut our story, for this time, at least, very short. Mr. Stewardson's letter is, to us, a very pleasant indication that one, at least, of our readers has not found our previous criticisms too long, and unless we hear from some persons of a contrary opinion, we shall, next time, again take courage to extend our observations to such length as may be required to do justice to the subject. If people knew how grateful it is to an editor to receive some indication that his lucubrations have found readers, they would not need to apologize, as Mr. Stewardson courteously does, for writing letters like his. Nothing is more discouraging for persons who write for publication than to feel as if they were beating the air. They are perfectly willing to have people disagree with them; in fact, in the present instance, Mr. Stewardson's praise of Walter Crane arouses in us belligerent sensations which are positively delightful,—but they cannot endure to think that no one reads what they write.—Eds. American Architect.]

SIZE OF THE PARIS HOTEL DE VILLE.

CINCINNATI, OHIO, January 24, 1893.

To the Editors of the American Architect:—

Dear Sirs,—Will you kindly print the chief dimensions of the Paris Hôtel de Ville in the next number of the *American Architect*? I have purchased the magazine regularly for three or four years and do not remember of ever finding the information.

Very respectfully, H. L. Bridwell.

[The new Hôtel de Ville measures 470 feet by 263. The central feature attains a height of 164 feet, while the angle pavilions are 85 feet high. The Salle des Fêtes measures 40 feet by 164 and is 43 feet high.—Eds. American Architect.]

NOTES AND CLIPPINGS

The Cost of Tweed's Court-house.—Apropos of the probability that during the present rule of a Tammany mayor a new city-hall will be built in New York, the *Evening Post* of that city publishes these instructive statements: The new court-house was planned in 1868, and was nearly completed when the Ring got possession of the work in 1869. The original appropriation for it had been $250,000, and about $4,500,000 had been expended upon it when the Ring took charge. For its completion and furnishing the members of the Ring expended over $8,000,000. They spent over $6,000,000 directly, and then over $2,000,000 for "repairs." The work was divided up among favored Tammany contractors, each of whom enormously increased the amount of his bill in order that the surplus might be divided among the members of the Ring. The total expenditures for different kinds of work performed in "completing and furnishing" are eloquently set forth in the following table, which we quote from Mr. Charles F. Wingate's valuable history of the Ring's doings, published in the *North American Review* in 1875:

Carpenter work and timber	$1,439,619.03
Furniture	1,575,782.96
Carpets, shades, and curtains	675,534.44
Plastering work	531,594.22
Painting and decorating	319,539.85
Plumbing and gas-work	750,313.37
Ironwork	132,564.90
Safes	404,347.72
Awnings	41,746.83
Articles (probably brooms, etc.)	41,190.95
Marble for work in progress	77,498.25
Pay-roll of work in progress	22,709.35
Superintendence of building	29,427.34
Thermometers	7,500.00
Locks	2,676.75
Total	$6,052,045.96

Repairs on woodwork	$750,071.92
Repairs on plaster work	1,294,684.13
Repairs on plumbing work	51,461.75
Repairs not defined	75,716.13
Total	$2,171,933.93

The names of the contractors who put this enormous amount of work into the building were very familiar in the community a few years ago. Keyser was the plumber, Garvey the frescoer and decorator. Ingersoll supplied the furniture, McBride Davidson the safes, and James W. Smith the awnings. The rate of charging was well

indicated by the latter's price for awnings, which was $150 each, though the usual price was $12.50. It was shown by Mr. Tilden's wonderful analyses of the accounts which were obtainable when the Ring was exposed that its members had a regular share in the 65 per cent addition which was uniformly made to every bill above its original amount. Tweed's share was 24 per cent, Connolly's 20 per cent, Sweeney's 10 per cent, Watson's 5 per cent, and Woodward's 5 per cent. Watson was the auditor whose duty it was to see that all the bills were "raised" before their payment was authorized, and Woodward was the disbursing agent, who took the warrants approved by Watson to the bank, got the money, and divided it among the contractors and the members of the Ring, giving to each his due share.

CHILLINESS OF ENGLISH COUNTRY HOUSES. — Where English country houses fail is not in want of space but in lack of warmth. It is astonishing that a sojourn of nearly 800 years in a sub-arctic region has not taught the Anglo-Norman race that a six-months' winter demands some greater provision for the change of temperature than the mere lighting of fires in a few sitting-rooms. As we have said before, the warming of the hall is the key to the position. In country houses the hall is nearly always of ample dimensions, and not one but all the sitting-rooms are on the ground floor, deriving their supply of fresh air from the hall, which, as in the London house, gets its stock,in turn, from under the main door. But the greater space leaves ample room for a thorough warming of the central air-chamber. Yet, in how few country houses is the hall properly warmed by stoves! With that provision omitted, the size of the hall and staircase merely prevents the air from ever becoming properly warmed at all; and for weeks the passages and bedrooms remain at a temperature in which it would be unsafe to allow even cattle to sleep. A further capital defect in most country houses is the absence in bath-rooms of either hot water or hot air, and the impossibility of obtaining any sudden increase of temperature in case of chill or illness. There are many large and costly country mansions less well provided in this respect than a fifth-rate London house. Contrast this with the conditions for indoor life as understood by the Romans during the three centuries in which they occupied this country. Every Roman villa, however small, as a visitor to any of the numerous excavations may see for himself, was thoroughly heated with hot air, running in pipes under the floors and up the walls. Better than this, the same furnace which distributed this even warmth throughout the house also heated a small hot-air chamber, or Turkish bath, next to which was a cold plunge-bath. The writer recently saw the remains of a Roman house, built some sixteen hundred years ago, perfectly fitted with a warming apparatus, while a modern house of six times its size, in the garden of which the old villa lay, was unprovided with any other means of heat than open grates. Naturally, the warming of country houses may be over-elaborated. But that is rare, though we have known instances in which a difference of two degrees between the thermometers in any two rooms was visited with dismissal to the domestics in charge, while the first impulse of a visitor was to rush to open a window. Minor adaptations, though not so important as those to secure space and warmth, are, nevertheless, of daily consequence. — *The London Spectator.*

CO-OPERATIVE TENEMENT-BUILDING IN BOSTON. — The problem of building healthy and comfortable tenements for the poor, which is in the experimental stage in Philadelphia, seems to have been solved in Boston, where the Coöperative Building Company last week declared a dividend of six per cent. The persons associated in the enterprise are not conducting it for profit, being men and women of well-known philanthropic views, and if the earning of a dividend has any significance, it is as a reminder to those also disposed to do good along the same line that wise business management is inseparable from success. The company now has buildings upon six thoroughfares. A descriptions of a group of houses recently built on Harrison Avenue will give an idea of the accommodations provided for wage-workers. These houses were built on the plan of a hollow square, the houses being in four blocks, — a block of eight each on Harrison Avenue and Reed Street, and four each on the two side streets, — are three stories high and forty feet deep. This makes an open court of 80 x 100 feet, an attractive feature, to be laid out as a sort of park, with paths and shrubs. The cost of the houses was $109,016.60, including $16,900 for the land. There are no single-room tenements in these blocks. The four corner houses contain, each, six tenements of two rooms each, the rents for which are $2.50 per week for each front and $2.25 for each rear tenement. The other twenty houses contain each a three-room tenement on the first floor, and a four-room tenement on second and third floors, for which the rents are respectively $3.50, $3.75, and $3.50 per week. There are, therefore, in these blocks, twenty-four tenements of two rooms each, forty-eight rooms; twenty tenements of three rooms each, sixty rooms; forty tenements of four rooms each, one hundred and sixty rooms. The total is twenty-four houses of eighty-four tenements, or 268 rooms, with three families in each house, except in the corner houses, which are arranged for six families. The average weekly rental per room is $1.01½, or $52.78 a year, making the total gross rental of $14,144 for the 268 rooms. While many of the tenants belong to the class of mechanics or artisans, more than a few are day-laborers. The houses afford comfortable and convenient homes for both poor and well-to-do tenants, and for both large and small families. — *N. Y. Evening Post.*

THE EXPENSES OF INSURANCE COMPANIES. — When property-owners are complaining of alleged high rates for fire insurance they not unfrequently say that the ratio of expenses to premium rates is too high, and shows extravagance on the part of the companies. These grumblers, apparently, do not understand that the expenses of a company include taxes and large sums paid for securing better fire-protection. For instance, the fire-patrols in various cities are supported entirely by the insurance companies; and the companies also maintain a large corps of surveyors and inspectors, whose duty it is to examine property to be insured, and to improve the fire-hazards of such property. If the facts were known, it would undoubtedly be shown that from twenty-five to thirty per cent of the entire expenses of a fire-insurance company are incurred with a view to lessening the fire-losses and improving the character of the property to be insured. It is an axiom almost in the business that if the total expenses of a company overrun forty per cent of premium receipts it is pretty certain to show loss on its underwriting account. The losses of a general-agency company are now expected to exceed sixty per cent, and the expenses must therefore be kept within forty per cent, if any profit is to be shown. The tendency of recent legislation is to increase the expenses of the companies, and consequently the only possible way in which they can hope to make both ends meet is to increase their premium receipts. When the combined losses and expenses continue to exceed income the natural remedy is to increase the income, inasmuch as the companies cannot control their losses, and legislation is continually adding to their expenses. If the companies were to summarily cut off all that portion of their expenses that goes to provide better protection to property the fire-losses of the country would be greatly increased. It is a question with many underwriters whether this is not the proper thing to do. Let property-owners make such risks as they see fit, and the insurance companies charge for the risks as they find them. As they do not do this, however, they are entitled to consideration for the very large sums they expend annually in the matter of fire prevention and protection. — *Spectator.*

THE METAL-WORKER. — The *Metal Worker*, one of the oldest and most admirably conducted of the legitimate trade-papers, marks the opening of the new year and its thirty-ninth volume by abandoning its blanket quarto form for the more convenient large octavo.

A FAMOUS WOODEN BRIDGE. — The most famous wooden bridge was built at Schaffhausen, in 1757, by Grubenmann, an illiterate carpenter. It had wooden arches with spans of 193 and 172 feet respectively.

TRADE SURVEYS

A SLIGHT advance in wholesale prices on leading staples within a few days has given rise to false hopes of a general improvement in values. No change has yet taken place in business conditions. A large volume of business is transacted weekly. Gold exports continue. If the statement of high financial authority is correct, — and there is no reason to doubt it, — that the extraordinary gold exports of the last two years have been due to temporary reasons, and have been made outside of ordinary trade movements, and that these funds are now held abroad for transient purposes, — then a reaction is only a question of time, and a return flow may be expected, with a consequent fall in gold and rise in silver. In financial circles there is an abundance of money. The surplus reserve is larger at this time than it has been for several years, with one exception: The loans and deposits are about the same as a year ago, while the New York banks have twenty-five millions less gold than a year ago. Our exports last year — merchandise, gold, and silver — were $1,011,713,999; balance in our favor, $135,515,820. Financiers predict easier monetary conditions, and, consequently, increased activity in railway building, soon after Europe begins to square accounts with ns, a matter which cannot be indefinitely delayed. There is no reason whatever for borrowing trouble over gold exports at this time, though writers in daily papers never cease dwelling upon the possibility. The banks at home are in a safe condition. Reports from various quarters tell of the gradual decrease of mortgage indebtedness. On the other hand, demands are arising for larger loans. There is a silent and unnoticed influx of industrial capital into several Western States, which is helping development. Mill and shop labor is busy almost everywhere. Wages have been lowered since autumn in a few industries to a slight extent, but the chief loss suffered by wage-workers has been in reduced working-hours. Within two or three weeks employment has increased, and in several industries preparations are being made for greater activity. There seems to be a unanimity among manufacturing interests to avoid accumulating stocks beyond reasonable proportions. Textile-goods and hosiery manufacturers have recently asserted the importance of this policy, and shown, by abundant statistics, the necessity for care in the out-turn of mills and factories. The same sensible policy obtains in other industries, where carelessness has prevailed heretofore. Within a week or two, an increase has been observed in commercial failures. By way of offset, there is an increase in the number of projected enterprises. It is well to keep in mind, however, that the manufacturing capacity of this country has reached a limit where great care is essential. A dangerous accumulation of merchandise is possible. The dangers of and from it are clearly understood. Manufacturers have been warned against it, and distributors continue to remind them of the dangers of departure from this line of action. A speculative era is earnestly hoped for by many who recall the excitements, and ups and downs of former speculative eras; but the common-sense judgment of enlightened business interests is that an even, steady progress is far better. The disposition to loan money on Western mortgages is not weakened, but there is a feeling that greater care is necessary. Quite a number of agencies have lately been established in the West, in the interest of Eastern lenders, with a view of keeping better posted, and these interests are exerting some degree of political influence in the complexion of State legislative bodies. The latest reports from Eastern commercial centres indicate increasing inquiry, a condition heretofore noted. More buying is being done. Buyers act as though higher prices were wellnigh impossible. Jobbers who keep well posted on trade-currents are pleased over the fact that store-shelves are low, and that great activity in buying must soon set in. In the heavier industries there is very little to report, but it is known that demand will assume large proportions before long. Iron, steel, and its products are wearing out. Machinery orders are large. Ship-building orders last week called for one hundred and twenty thousand tons of steel plates and shapes. The builders are making contracts for material, and the increase of electrical and cable lines is encouraging builders to enter upon still larger operations.

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CONTENTS

SUMMARY: —
The French Mutual Defence Society wins another Case. — Alterations on a condemned Building. — The Value of Ground-rents in London. — Dynamite and Real-estate Values. — Proposed Memorial to Professor Létang. — History of a Water-gas Plant. — Restoring Restorations: St. Mary's, Oxford. — The Manufacture of Spurious Antiquities. . . . 81
THE ILE-DE-FRANCE SCHOOL OF ARCHITECTURE. — IV. 83
ARCHITECT, OWNER AND BUILDER BEFORE THE LAW. — XXVIII. 85
THE GOVERNMENT BUILDINGS BILL. 88
COMPARATIVE MUNICIPAL BUILDING LAWS. — XXI. 90
THE DUTIES AND RESPONSIBILITIES OF ARCHITECTS. 91
THE ENGLISH METHOD OF OBTAINING TENDERS. 93
AN ENGLISH HUMORIST ON AMERICAN ARCHITECTURE. 94
SOCIETIES. 94
ILLUSTRATIONS: —
House of Henry D. Welsh, Esq., Wissahickon Heights, Philadelphia, Pa. — Industrial Trust Company's Building, Providence, R. I. — Design for a College Fraternity Chapter-house. — House at Cynwyd, Pa. — House at Ogontz, Pa. — Great Hall in the Same.
Additional: House, Corner Goethe and North State Streets, Chicago, Ill. — Central Porch and Rotunda of the Fisheries Building, World's Columbian Exhibition, Chicago, Ill. — Detail of the Same. — The Staircase of Francis I, Château de Blois, France. — Detail of the Same. — Tate Central Library, Brixton, Eng. 95
NOTES AND CLIPPINGS. 95
TRADE SURVEYS. 96

THE French *Caisse de Defense Mutuelle* has intervened successfully in a lawsuit of a kind rather out of the common way, but of considerable professional importance. A certain Hébert, proprietor of a house in Rouen, wished to underpin and strengthen the front of the building, and applied, in the usual way, to the city authorities for a permit to do the work. It happened that the house was "*frappée d'alignement*," that is, had been placed within the operation of the French law under which, when a street widening is determined upon, the necessary land for the widening, exclusive of the buildings, is taken and paid for, but the buildings themselves are left undisturbed, provision being, however, made that no repairs shall be made on the buildings which will prolong the existence of the portion projecting beyond the new lines; so that, as fast as the buildings fall down, or are rebuilt, the street finds itself gradually widened. The city authorities refused the permit, on this ground, but it seems that an exception is made to the general prohibition of repairs where the part of the building projecting over the new line is so great that the remaining portion would be of little use; and, on appeal to the prefect of Seine Inférieure, it was decided that the Hébert house, which projected nearly twenty-three feet over the new street-line, came under this exception. The prefect, therefore, annulled the action of the city officials, deciding that the refusal of the permit was unauthorized.

ALL this discussion took nearly eight months' time, and it was not until April 13, 1892, that the prefectoral decree was issued, declaring the illegality of the decision of August 21, 1891, by which the permit was refused. On the announcement of the decree, Hébert made another application for a permit. This time, the city functionaries thought of an ingenious scheme to baffle him, and took no action whatever on his application. There is a statute of 1852, intended originally only for Paris, but extended to Rouen in 1853, which provides that the architect or builder shall file with the proper authorities a plan and figured sections "of the constructions which he proposes," and that, twenty days after filing them, he may commence work according to his plans, if he has not meanwhile been notified of any prohibition. Hébert's architect, Gouault, filed his plan and other drawings in due form, with the application for a permit, and, at the expiration of twenty days, no word of any sort having been received from the city officials, the work was begun by setting shores against the front, preparatory to underpinning. This was on June 9, 1892, nearly ten months after the first application. As soon as the shores were set a complaint was lodged against Hébert, and he was arrested, fined five francs, and condemned to remove the shores at once. To the representations of Hébert that the twenty-day limit had expired, the city authorities, supported by the judge of the police-court, replied that this part of the law applied only to permits for new work, and had nothing to do with operations for repairing or consolidating old buildings. In this emergency, M. Gouault applied to the *Caisse de Defense Mutuelle* for advice. The secretary of the association consulted not only the members and regular advisers of the standing committee, but the chief of the "*Bureau des Alignements*" of Paris, and other experts, and returned answer that the claim of the Rouen officials was without foundation. Gouault then appealed for Hébert from the judgment of the police-court to the Tribunal Civil, which held that the police-judge was in error in deciding that the statute of 1852 applied only to permits for new buildings, and declared that this statute made no distinction, and was applicable to works of all sorts, whether new constructions or modifications of old ones, and ordered that the proceedings against Hébert should be annulled, and that he should be allowed to continue the work which he had commenced.

THE *British Architect* says that the lease of a house in London, having nineteen years to run, at a ground-rent of twenty-two hundred and fifty dollars a year, was recently sold at auction for one hundred thousand dollars. The house is numbered 77 and 78 Pall Mall, and was formerly the town mansion of the Marquis of Ailesbury. It is now divided into two stores, and the value for business purposes of that location has risen so much as to make it seem profitable for a purchaser to pay what is equivalent to about ten thousand dollars a year for the next nineteen years for the privilege of hiring two stores for eleven hundred and twenty-five dollars apiece. Such an increase in rental value of property in what was, twenty years ago, a narrow and dingy street with only a few shabby shops in it, surpasses anything that we know of in our older cities. It is common enough with us, where new streets are opened, or new street-car lines built, to see selling-values multiplied by five or even ten; but rental-value is a very different thing, and many an estate which could be sold now for five times what it was worth twenty years ago will only bring a little more rent, the increase in selling-value being almost purely speculative.

M. LÉON MAURUC, who writes the real-estate articles in *La Semaine des Constructeurs*, calls attention to the fact that the dynamiters have done great injury to real-estate interests in Paris. Not only are the owners of buildings, who are exposed to the danger of having their property blown to pieces if a person unfriendly to anarchy should happen to take a lodging in the neighborhood, disposed to sell, but persons who would otherwise favor a real-estate investment in Paris now prefer to keep their money somewhere else. After the last explosion, real-estate transactions in the city were for some time nearly suspended, and prices have fallen greatly. In reality, the danger to the proprietor's pocket is not, perhaps, so serious, if he himself keeps discreetly out of the way. For the present, the State undertakes to reimburse all losses caused by dynamite explosions, and, besides this, several insurance companies have been formed, both on the mutual and the ordinary plan, which will insure houses in any part of Paris against the consequences of explosive politics.

IT appears that the Trustees of the Boston Public Library have set apart a room over the main stairs in the new building which is to be known as the "architect's room," where, amongst other things of correlative interest, are to be placed memorials of those American architects of high worth to whose efforts death has put an end. It is proposed that one of these memorials shall be devoted to perpetuating the name and commemorating the life-work of the late Prof. Eugène Létang, and a committee has been appointed by the Boston Society of Architects to secure the necessary funds, decide on the character which shall be given to the memorial and take steps for its preparation. It is assumed that the many pupils who benefited by M. Létang's advice will be not only willing but desirous to aid

in so appropriate a movement as this; but, although it can be ascertained who these pupils were, it is not so possible to discover what their addresses at present are: therefore we request that all persons who are willing to join in bringing into being the proposed memorial will put themselves into communication with Mr. Alexander S. Jenney, 218 Boylston St., Boston.

AS the gas-companies in many of our large cities, and some of the small ones, have taken up the practice of furnishing water-gas for heating purposes, at the "reduced" price of about a dollar a thousand feet, it may be interesting to recall the history of the first large water-gas plant in England, which was established by a private corporation, for its own use. This corporation was the Leeds Forge Company, which, for certain portions of its work, needed a more intense heat than could be obtained even with a Siemens regenerative-furnace. As it is well known that the combustion of hydrogen produces a more intense heat than any other available chemical action, the company resolved to build apparatus for generating hydrogen on a scale sufficient for its requirements. The simplest way of producing hydrogen pure enough to be used for burning in a furnace is to pass vapor of water over intensely heated carbonaceous matter, which retains the oxygen, setting free the hydrogen. The Forge Company, therefore, set up several "generators," consisting principally of iron tubes, which were heated to whiteness by a blast. In the tubes were placed bits of coal, or coke, and, after the requisite temperature was reached, the blast was shut off, and steam admitted. This was instantly decomposed, the hydrogen, very impure, and mixed with carbonic oxide and carbonic acid, escaping through outlets provided for it. After the process had received its full development at the works the generators were charged every fifteen minutes, producing seventy thousand cubic feet of crude hydrogen per hour. A portion of the crude gas was led immediately to the steam-boilers, where it was used, to the exclusion of all other fuel, for generating steam to supply the establishment. Another portion was purified by passing through water, and conducted thence to feed the forges and welding furnaces; and the rest, after further purification, and mixing with naphtha vapor, was used as illuminating-gas for lighting the establishment. The advantages of the gas-flame for forging and welding, over that of burning coal, are obvious enough, but it appears that a great saving was made in the cost. The production of gas was about thirty thousand cubic feet for each ton of coal consumed. The cost of the coal was about two dollars per ton, and the labor and other expenses incidental to the production of the gas amounted to about eighty-five cents more, making the total cost of the gas, delivered at the forges, four and one-third cents per thousand cubic feet; while its effectiveness was so much greater than that of coal that the Forge Company made, almost from the outset, a saving in cost of fuel for the works of about fifty thousand dollars a year.

IT seems that the church of St. Mary, at Oxford, is undergoing repairs, and, curiously enough, it is not the original fabric which was built in the fourteenth century, and is, therefore, between five and six hundred years old, but some restorations, executed about forty years ago, which need overhauling. The present trouble comes mostly from the pinnacles around the base of the spire, which were practically rebuilt during the last restoration, but were executed in stone of such inferior character that they have already decayed badly, and this, with the imperfection of the joints and bedding, has left them in a condition where little more than a touch is required to push them over. This is by no means the first illustration of the fact that the mediæval architects possessed a knowledge of stone which no modern engineers or architects can approach. Not only does modern work, placed by the side of the old, as often happens in church restoration, often decay in a few years, while the old, after several centuries, shows no sign of deterioration, but, even where stone is taken by the moderns from the same quarry as that which furnished material for the old work, it is apt to be far less durable. In most cases, this is due, not to the inferiority of the stone itself, but to the absence of the consummate skill with which the mediævals employed stone, using it in such a way as to prevent its decay, even when the stone itself was of inferior quality. Viollet-le-Duc, in his *Dictionnaire Raisonnée*, under the head of "*Pierre*," gives most interesting details on this subject. In our own country, the problems presented by stone construction are perhaps more difficult than anywhere else in the world. Stones which resist the soft climate of England and France for centuries, like the Caen stone, and other oölites, are rapidly and deeply affected by the alternations of warm soaking rains and intense cold, which are characteristic of our winters; and granite, marble and the harder limestones, with, perhaps, a few intensely hard sandstones of the Potsdam type, seem to be our only reliable building-stones. Of the native oölites, some appear to be much more compact than the Caen and Bath stones, and may prove to have their good qualities, without some of their bad ones, but they have hardly been thoroughly tested as yet. In North Germany, which has a climate much like ours, stone is little used, the ordinary building material being brick, so we have only our own intelligence to guide us in the matter, and as hardly any subject is of more importance to the architect, and all additions to our present knowledge will be welcome, students in architectural and engineering schools might, with advantage, devote a good deal of their thesis work to investigations which ought to be made, but which architects in active practice have neither time nor facilities for attempting.

THE disclosure of the attempted fraud, by which the Louvre came very near purchasing, at an enormous price, an antique, or rather a Renaissance, statue of modern fabrication, has brought out many amusing stories in both the French and German papers. It is said, for example, that a regular manufactory of relics of the lake-dwellers exists in Switzerland,—we believe at Neuchâtel,—and Roman and Egyptian antiquities are produced in great numbers in various places. Perhaps the most ambitious, as well as most successful, imitators of the antique are to be found in Paris, and their ingenuousness in regard to their affairs is certainly charming. One of the contributors to *La Semaine des Constructeurs* says that he was once lunching, with several other guests, with one of the most distinguished collectors of antiquities in Europe. In the course of the repast the host went to the stove, to take a dish out of the plate-warmer attached to it, and, in moving the dish, knocked over two or three beautiful bronze statuettes of the Gallo-Roman period. One of the guests asked the collector what the statuettes were doing in the plate-warmer. "They are aging," was the smiling reply. Some time afterwards, the writer of the letter was in the same house, where he found the collector selling one of the Gallo-Roman statuettes to an amateur. The transaction was concluded at an exorbitant price, the seller taking care, however, to say, as is the custom with dealers in antiquities, that he guaranteed nothing in regard to the genuineness of the object. As the amateur departed with his prize the collector turned with an apology to his friend: "That was a German," he said. "I only sell my copies fixed up in that way to foreigners."

ON another occasion, the same correspondent was visiting the famous Retrospective Exposition at the Trocadéro, in company with a skilful and noted manufacturer of earthenware. As they were examining the collection of ancient Rouen faïence, the potter pointed out five or six pieces, and said: "Those objects came from the factory of your humble servant." "But the glaze is crackled," said his friend, surprised. "Yes," replied the manufacturer, "it is my daughter who has charge of that little trick. She is very skilful in matters of the sort; but we only sell such objects to *bourgeois*." Whether the rich Americans who bring home antiquities from Europe count as "*bourgeois*" or "foreigners" we cannot be sure, but there is reason for supposing that they appear to dealers in bric-à-brac as both at once, and they will do well to be very much on their guard. Even here, the trade of making false curiosities is not unknown. Many years ago, when the "Cardiff Giant," a mysterious statue, which was supposed to have been dug out of the bed of a brook somewhere in New York State, and to belong to some pre-historic civilization, was exciting the attention of the credulous, we had occasion to write to a stone-carver about some work. He replied, saying that he had an order for, we think, six Cardiff Giants, to be delivered within a very short time, and, until they were completed, he could not undertake any other work. What became of his statues later we do not know; but, as the Cardiff Giant still figures occasionally among the attractions of the dime-museums, we presume that they are still going the rounds among the ignorant.

THE ILE-DE-FRANCE SCHOOL OF ARCHITECTURE.[1] — IV.

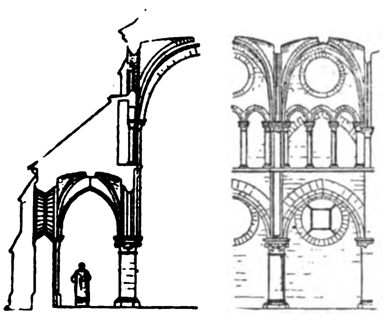


Fig. 18. Church of Arcueil.

FROM about 1165, when Notre-Dame de Paris was begun, several essential modifications were made in the plans and general arrangement of the churches of Ile-de-France. Notre-Dame itself was destined to found a school in the capital and vicinity, with its five aisles and deambulatory without any semicircular recesses. By examining the Paris churches of Saint-Séverin (see *American Architect* for August 16, 1890, "Religious Architecture," Fig. 29), Saint-Nicolas-des-Champs and Saint-Eustache, it is easy to trace the transmission even into the very heart of the Renaissance. Double side-aisles are found in churches whose quite secondary importance seems not to warrant their presence, for example, at Beaumont-sur-Oise. Of deambulatories without chapels, we will cite those at Gonesse, Domont and in Saint-Nicolas of Meulan; of flat chapels, those in the Paris churches named above, and in many others down to the eighteenth century, for instance, at Saint-Nicolas-du-Chardonnet and at Saint-Sulpice. Morienval had taken the initiative in this rather graceless arrangement a century and a half at least before Notre-Dame (we know that at Notre-Dame the choir chapels were added at the close of the thirteenth century: see the primitive plan under "*Cathédrale*," Fig. 25), but this is not what the Parisians of the thirteenth and following centuries intended to copy. At Notre-Dame de Mantes, which so resembles Notre-Dame de Paris that it is impossible not to attribute both to the same architect, though no one can venture to say which is the older, there were likewise no radiating chapels before the latter part of the thirteenth century.

When no deambulatory exists, and when each side-aisle terminates in a chapel, the latter, if not in the form of a hemicycle or a demi-polygon, often has for its base the diagonal rib of the bay on which it opens, and consequently presents an inclination of 45°; examples are seen at Ferrières [see "*Abside*," Figs. 5, 6], and especially at Braisne, where they are double on each side, resting, on one hand, against the transeptal arms, and, on the other, against the central apse [see "*Abside*," Fig. 7]; this is certainly the plan of Saint-Yved of Braisne, which was transported by Vilard de Honnecourt, perhaps, to the Cathedral of Kaschau, in Hungary, where it is copied (see *American Architect* for November 15, 1890, "Austrian Architecture," Fig. 19). Sometimes, to compensate for the lack of a chapel proper, a single, simple recess was made in the *chevet*, whether the latter was straight or rounded. This disposition, indicated externally by a projection terminating in a gable, is to be noted particularly at Vernouillet [see "*Abside*," Figs. 9, 10], at Villers-Saint-Paul, and here and there in Soissonnais.

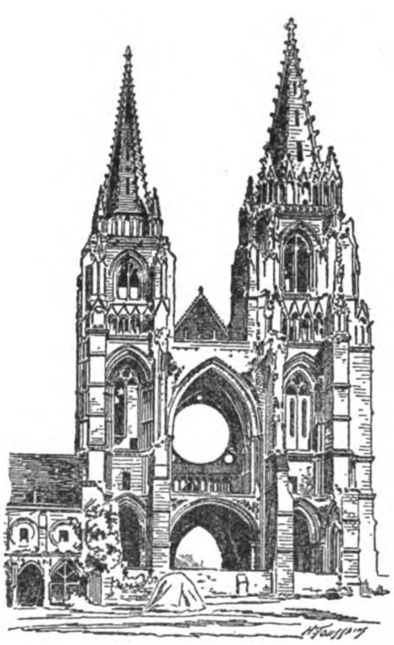


Fig. 19. Church of Saint-Jean-des-Vignes, Soissons.

In Valois, the thirteenth-century architects conceived a way of disposing the transept without interfering with the arrangement of the nave vaults: they included two of the latter in its width, and prolonged the intermediary transverse arch into both arms, thus dividing them, as it were, into two equal aisles; examples occur at Saint-Jean-aux-Bois, at Vauciennes and Verberie, of the thirteenth century, and at Roberval and Fresnoy-la-Rivière, of the fifteenth. Another, and much more important creation, is also due to Valois: Saint-Frambourg at Senlis, a church of equally admirable proportions and style, begun in 1177 and quickly completed, — as may be inferred from its perfect unity, — is unquestionably the prototype of the *saintes chapelles*; the nave is simple, with no side-aisles, transept or annex of any kind, but with an apse of the same diameter and height as itself.

In elevation we retain only one stroke of originality, but this is quite marked; we refer to the extremely supple rôle, if one may so express it, of circular apertures. The influence of Notre-Dame apparently counts for much in this frequent adoption of the *œil-de-bœuf*, for it is confined to a restricted area around the capital. Within this district the *œil-de-bœuf* takes the place of windows in the side-aisles as well as in the nave, as at Arcueil (Fig. 18); here it replaces the upper windows only; this is the case usually; other examples may be studied at Bagneux, Bougival, Louveciennes, Mareil-Marly, Champigny, Montreuil-sous-Bois, Ferrières, Jouy-le-Moustier, etc.; sometimes it is found in the triforium, and it was in this part of his edifice that the architect of Notre-Dame had introduced an entire series of these openings, transformed into rose-windows by means of mullions of various patterns [see "*Cathédrale*," Fig. 24, a bay of Notre-Dame restored by Viollet-le-Duc, as it was prior to the middle of the thirteenth century]. At Vitry-sur-Seine, at Gouvernes, near Lagny, and in the collegiate church of Champeaux, there are *œils-de-bœuf*, which fulfil an analogous function. In small churches with a normal triforium and only circular bays in the upper story, the whole blends into a single disposition framed-in by the *formeret*. The oculus, in lieu of a window on the sides of the church, constitutes one of the features by which the influence of the Parisian school can be recognized outside its own territory; this it was that enabled us to detect it in the choir of Saint-Étienne at Caen and in a church of Béarn, at Sauveterre.

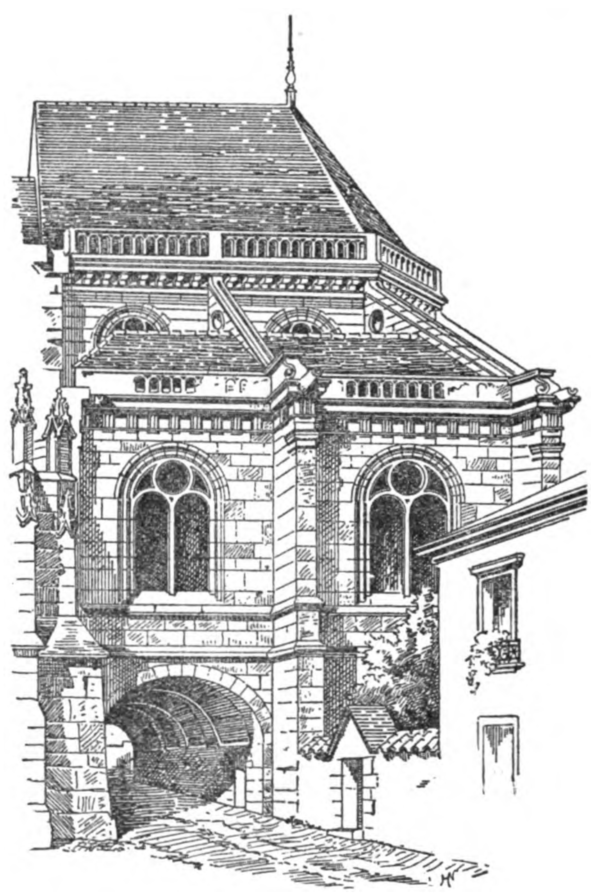


Fig. 20. Apse of the Church of Triel.

As though exhausted by the inventive efforts of nearly two centuries, and content with its renown, the French school rested from its labors after the reign of St. Louis; but, from

[1] From the French of Anthyme Saint-Paul, in Planat's *Encyclopédie de l'Architecture et de la Construction.* Continued from No. 893, page 68.

the moment when it ceased to create, it lost considerably in originality. The churches of Saint-Martin-aux-Bois [see "*Contrefort*," Fig. 27], and of Saint-Sulpice-de-Favières are, notwithstanding the incomplete state of the towers, monuments of finished elegance; but if they were removed to any other part of northern France they would hardly seem out of place in their new setting; a similar observation might be made concerning the basilica of Saint-Denis, which was largely rebuilt between 1231 and 1280, in a style approaching that of Notre-Dame of Amiens. It was the belfries and plans of the choirs especially that retained the local stamp: this was usually to their advantage.

In the thirteenth, fourteenth, fifteenth and sixteenth centuries, under influences radiating probably from Senlis, a large number of stone spires were erected in Valois and Soissonnais, at Senlis, Crépy, Creil, Plailly, Ève, Montagny-Sainte-Félicité (this last about 1600, in the reign of Henry IV, according to Woillez), etc.; they were mostly of moderate dimensions. At Saint-Jean-des-Vignes at Soissons, above the façade, which constitutes all that remains of the monument, rise two more important spires, of the fifteenth century (Fig. 19); they are

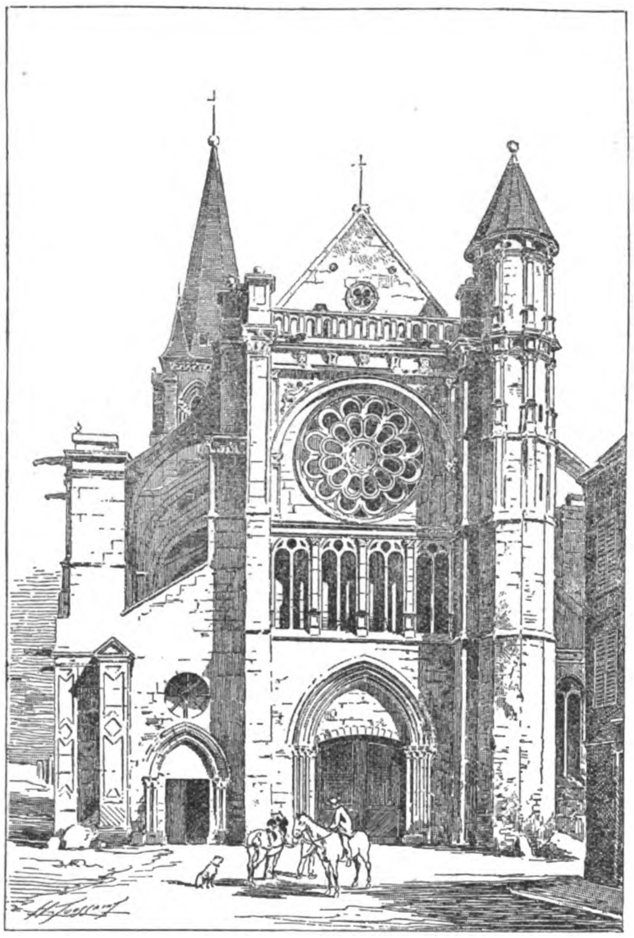


Fig. 21. Church of Brie-Comte-Robert.

established by a sort of fusion of the two types described above.

As appears from observations already presented, the plan of Notre-Dame was perpetuated at Paris, where Saint-Eustache, the largest and most complete of the religious structures of the French Renaissance, is a striking reproduction of it. The trace of the choir of the church of Triel (Fig. 20), in the arrangement of its chapels, is related to the rather singular plan of a thirteenth-century edifice, Saint-Quiriace of Provins. Still, the Renaissance was not a period of inaction in the Parisian school. Aside from Saint-Eustache and the church of Triel, it produced the nave of Saint-Étienne-du-Mont and the choir of Saint-Leu at Paris; the graceful façade of the church of Belloy; a number of small churches — in whole or in part — in the section bounded by Senlis, Saint-Denis and Pontoise, and including the first and last of these towns; the church of Montfort-l'Amaury, the façades of the churches of Brie-Comte-Robert (Fig. 21) and Othis; the choir of Notre-Dame de la Ferté-Milon; and, on the confines of Normandy, several interesting works which M. Palustre, in "*La Renaissance en France*," attaches to a wholly local school having its seat at Gisors.

The history of Parisian civil architecture is devoid of any special interest down to the Renaissance. The vast structures reared under the orders of Francis I, Henry II, Charles IX, Catherine de Medici and Anne de Montmorency, and directed by architects or sculptors such as Pierre Chambiges, Bullant, Lescot, Delorme, Cousin, Goujon and Pilon, — the Louvre, the castles of Blois, Fontainebleau, Saint-Germain-en-Laye, Villers-Cotterets, Madrid, Challuau, Monceaux, Écouen and Chantilly, the fountain of the Innocents at Paris and the mausoleums at Saint-Denis, — belong to the general history of the national art of France. An exception should be made for the dwellings of Orléans, which, with their small arcaded courts, their pavilions, some of which are broken with projections and recesses, and the charming windows of their façades, have the merit of being entirely local in type (Fig. 22). Chartres also presents a few interesting, though less original, houses (Fig. 23).

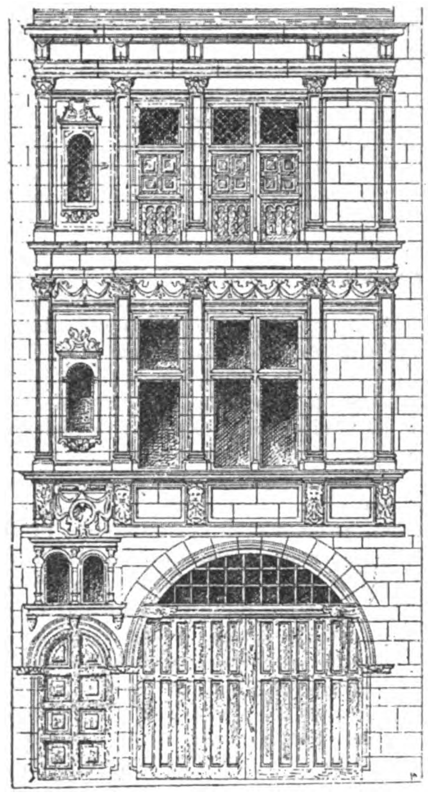


Fig. 22. House at Orléans.

The private residences of Blois, Vendôme and Paris, the hôtels-de-ville of Paris, Dreux, Beaugency and Orléans belong, like the great châteaux and the great works of sculpture referred to above, to the history of the Renaissance of all France.

In military architecture the school asserts itself solely, though amply, in the donjon. From the eleventh century, and perhaps from the tenth, if the big tower of Châteaudun is really the one reared by the notorious Thibaut le Tricheur [see "*Châteaudun*," Figs. 3, 5, 7], Ile-de-France adopted the cylindrical donjon in opposition to the Norman oblong with buttresses. The latter was, however, copied out and out at Beaugency and, in a more or less altered state, at Moret and at Chevreuse; as an offset to these we find in Normandy, near the Epte, at Château-sur-Epte and at Neaufles-Saint-Martin, donjons of the French type, whose influence told on the constructions of Richard-Cœur-de-Lion, notably on the Château-Gaillard. Some of the twelfth-century donjons are externally in the form of polygons of twelve to sixteen sides, the angles being sometimes bare and sometimes covered with flat buttresses; for example, those of Châtillon-sur-Loing (Fig. 24)

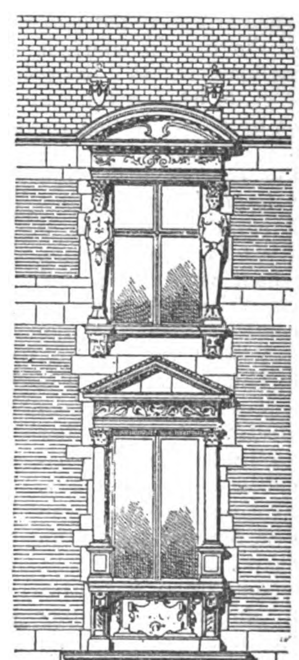


Fig. 23. House of the Physician, Chartres.

and of Maurepas. The tower of the Louvre was a Parisian donjon; but the triumph of the type, the king of all donjons, is the well-known big tower of Coucy. In the twelfth and thirteenth centuries some very curious varieties of form sprang up: at Étampes the Guinette, built by Louis le Gros, consists of four semi-cylinders [see "*Donjon*," Figs. 6, 7]; the tower of Houdan is one huge cylinder cantoned by four round turrets; that at Provins is square and is surmounted by an octagon with which it is united by means of turrets and flying-buttresses [see "*Donjon*," Figs. 8, 9, 10]. Under St. Louis, at Montlhéry, the architect had returned to the purely cylindrical donjon; but in the time of Philippe le Bel or under the first Valois kings, the square flanked by round turrets was adopted, a type of which the donjon of Vincennes furnishes the noblest example. In the thirteenth century it was sometimes admitted that a château could be built without a donjon — as at Yèvres-le-Châtel, near Pithiviers.

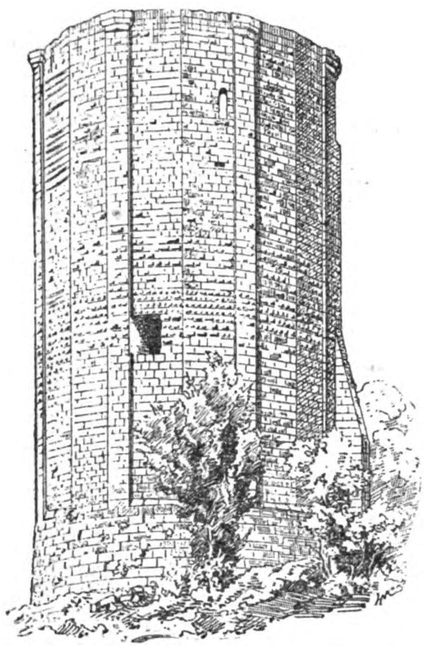
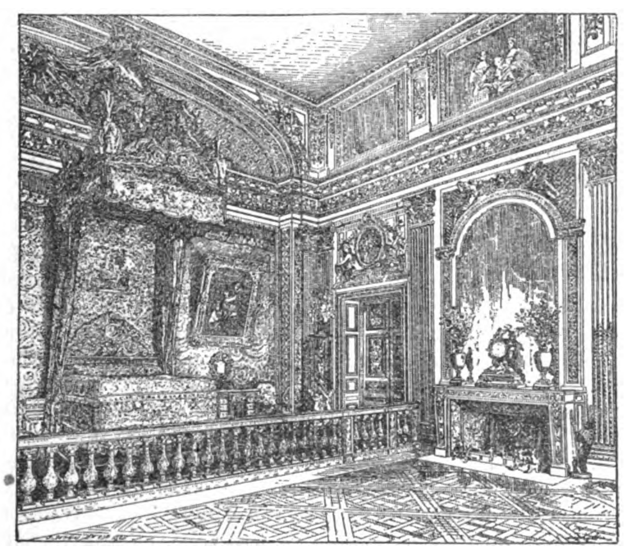


Fig. 24. Donjon of Châtillon-sur-Loing.

All stamp of a special school disappeared from the military architecture of the Paris district from the end of the fourteenth century; for this reason nothing need be said here of the castle of Pierrefonds.

In conclusion, we would remark that it is in the field of religious architecture, and especially because of the part that it had in the creation of the Pointed style, that the School of Ile-de-France merits a fame that is still far inferior to its deserts. ANTHYME SAINT-PAUL.

ARCHITECT, OWNER & BUILDER BEFORE THE LAW.[1]—XXVIII.



Royal Chamber at Versailles. From "*La France Artistique et Monumentale.*"

EVEN where the work done costs more than that contracted for, the person who does the work runs a serious risk of not being able to get his pay for it, if the deviation from the contract was intentional. A contract[2] was once made for the erection of a saw-mill, to be 50 feet wide and 100 feet long. The contractor, for reasons of his own, built it 100 feet long and 78 feet wide. When it was done the owners refused to pay for it. The plaintiff proved that, as built, the mill cost more, was of greater value, and was better adapted to the purpose for which it was to be used than it would have been if built according to the contract. The Court rejected all these representations, and held that the structure was not a substantial compliance with the contract, and nothing could be recovered.

[1] Continued from No. 890, page 21.
[2] Swain *vs.* Seamans, 9 Wall. 254.

In a New Jersey case,[3] the judge, in giving his decision, made an admirable comparison of the doctrines held by the courts of different States on the subject.

In this case, a contract had been made for the erection of a house, in accordance with certain plans and specifications, for the sum of $26,880. The house was not built as specified, and the owner made some changes. After the house was completed, suit was brought by the builder for $13,005.74, as balance due under the contract and money due for extra work. The owner refused to pay it, on the ground that the contract, which was under seal, was entire, and that, as the work had not been done according to the contract, or accepted by him, nothing was due. It was proved that the roof leaked on account of the specification not having been followed, and there were other serious variations from the contract, which were not denied by the contractor; but the owner had occupied the house and given some evidences of having virtually accepted it. The judge before whom the case was tried instructed the jury that the plaintiff might establish his claim in this form of action either (1) by proof that the contract had been, by the agreement of the parties thereto, so deviated from as to evince that the contract was abrogated or abandoned, and that the work directed by the owner was done under another and implied contract; or (2) by proof that the defendant, notwithstanding substantial discrepancies between the building as completed and that required by the contract, accepted and retained the same, and derived benefit therefrom. In regard to the first point, however, the attention of the jury was directed to the meagreness of the evidence in relation to it, and the judge observed to them that, as the contract itself provided for deviations and changes of plan, they could not properly draw the conclusion that the contract was abrogated merely from such deviations and changes.

In regard to the second point, the judge explained that "Where a defendant has accepted the work and materials furnished by a plaintiff, has taken possession of and derived benefit from such work and materials (although there was a special contract) under such circumstances as amount to acceptance, the law implies a promise on the part of the defendant to pay such remuneration as the benefit conferred on him is reasonably worth, and, to recover that quantum of remuneration, an action of *indebitatus assumpsit* is maintainable." "This rule," the judge said, "applies to buildings on land of the defendant, as well as to mere personality. The principal question is, if there has been acceptance of the building by a defendant. Mere naked occupation of a building erected on the land of the owner does not, by itself, waive the special contract unless the possession is coupled with some act or some language from which acceptance and acquiescence may be reasonably inferred." The jury were required to find whether, in the present case, the house had been thus virtually accepted by the owner, and found, from the evidence, that it had been. The Court thereupon gave the plaintiff judgment for his claim, deducting $300 as the amount to be allowed for the deviations from the contract.

The defendant appealed to the Supreme Court, objecting, through his counsel, particularly to the charge of the judge to the jury in the court below about the virtual acceptance of the building. In regard to this, the judges of the Supreme Court, in their final decision, said: "It will be at once perceived that "the consideration of the subject brings up several of the "vexed questions respecting the rights and liabilities of parties "to a contract for the erection of buildings on land. Such a contract deals with a subject-matter of a peculiar nature. When "an agreement for the manufacture of a chattel out of materials furnished by the maker is not performed according to "its terms, the remedy of the party for whom it is made seems "perfect, and the rejection of the chattel, while completely "protecting him, does no injustice to the maker, for it leaves "in his hands the materials with which his labor has been

[3] Bozarth *vs.* Dudley, 15 Vr. 304.

"united.. But when, under a contract for building, labor and "materials of the builder are put into an edifice immovably "affixed to the lands of another, and the title to which goes "with such lands, the right of rejection, while it may be said, "theoretically, to exist, is difficult to enforce in practice with- "out apparent injustice to one party or the other. If the "building be wholly unlike that contracted for, the owner is "put to the delay and expense of removing it from his land, "which it encumbers. If, as is more usual, the building is "not so unlike that contracted for as to permit the owner to "feel reasonably justified in removing it, or if he is driven "by necessity to use the shelter of the building, and if, by "protest and rejection, he may escape payment, yet, if the "building adds anything to the value of the land, eventually he "or his heirs become benefited thereby.

"These considerations have led to some contrariety of judi- "cial views, as cases with differing circumstances have been "presented.

"There is a line of cases, of which Ellis *vs.* Hamlin, decided "at *nisi prius* by Chief Justice Sir James Mansfield, and "reported in 3 Taunt. 53, and Munro *vs.* Butt, 8 El. & Bl. "738, in which the judgment of the Queen's Bench was "delivered by Lord Campell, are examples. They hold that "when the contract remains open and unperformed, though in "slight particulars, no recovery can be had, either upon it, or "upon an implied contract. This line of cases was elaborately "reviewed by Judge Comstock in Smith *vs.* Brady, 17 N. Y. "173, and contrasted with cases in the New England States, "which seem at variance therewith.

"The rigor of this rule has been frequently modified. Thus, "we find another line of cases holding that recovery upon "such and similar contracts will not be refused for mere "technical, inadvertent or unimportant deviations from the "terms, but that whenever there has been a substantial com- "pliance with the contract recovery may be had thereon, a "proper allowance or reduction from the contract price being "made for deficiencies. See Glacius *vs.* Black, 50 N. Y. 145; "2 Addison on Contracts, Sections 864, 865; Cutler *vs.* Close, "5 C. & P. 337; Dallman *vs.* King, 4 Bing. N. C. 105; "Stadhard *vs.* Lee, 3 B. & S. 364.

"A like variance of judicial views exists in cases where the "contract has not been so performed as to justify a recovery "thereon even under the modified rule above stated. On "examination, we shall find two classes of cases permitting a "recovery under such circumstances, as upon a *quantum* "*meruit*. One class adopts the view that recovery should be "had in such cases whenever the work and materials are of "any value to the owner of the lands to which they have been "affixed, and that the proper measure of damages is the con- "tract price, deducting therefrom so much as the house was "worth less on account of variations from the contract. This "is the view of the Massachusetts courts, as expressed by "Chief Justice Parker in Hayward *vs.* Leonard, 7 Pick. 180; "Smith *vs.* First Congregational Church, 8 Pick. 178; and "see also Snow *vs.* Ware, 13 Met. 42; Atkins *vs.* Barnstable, "97 Mass. 428; Fitzgerald *vs.* Allen, 128 Mass. 232.

"The other class presents the view adopted by the Supreme "Court of the United States in Dermott *vs.* Jones, 2 Wall. 1, "which holds that while a contractor guilty of fraud, or having "wilfully abandoned the work unfinished, cannot recover in "any form of action, he may recover in *assumpsit* when he "has, in good faith, done work which, though not done accord- "ing to the contract, has been accepted by the owner. In this "event, it is also held that the recovery is to be founded, as to "amount, upon the contract price, making such deductions as "required by the contractor's deviation from the contract.

"These cases do not differ so much as at first appears. In "the Massachusetts cases, the conclusion is put upon the "ground of a practical acceptance of the building on the part "of the owner. Thus, speaking of the distinction between the "manufacture of a chattel and the erection of a building, "Chief Justice Parker, in Hayward *vs.* Leonard, says: 'In "'such case the owner of the land necessarily becomes the "'owner of the building. . . . though the owner may at first "'refuse to occupy, he, or his heirs or assignees, will eventu- "'ally enjoy the property.' He also declares that in cases of "a gross and fraudulent violation of the contract, as, for "example, where the building is wholly variant from the "contract, no recovery can be had except upon an express or "implied acceptance. He confines the rule to cases where "there has been an honest intention to go by the contract, and "a substantial execution of it, with variations comparatively "slight.

"In each class of cases, acceptance is the basis of recovery. "One class, however, requires the acceptance to be actual; "the other assumes it to exist in all cases where value has "been conferred upon the property, and there has been no "gross or fraudulent violation of the contract; when such "a violation occurs, actual acceptance is necessary to re- "covery. . . . In School Trustees *vs.* Bennett, 3 Dutch. 513, "this Court declared the necessity of an entire completion of "such a contract as a condition precedent to the right to pay- "ment of the contract price; but this action was upon a "guaranty for the performance of a contract by a builder, who "had, though paid part of the price, wholly failed to complete."

"The rule most agreeable to the principles governing con- "tracts is, it seems to me, this: When a contract for erecting "a building has not been so performed that a recovery can be "had thereon, a recovery in *assumpsit* upon the common "counts for work and materials furnished in the erection will "only be permitted when the owner has actually accepted the "building erected. The view that assumes acceptance from "the mere fact that the edifice adds value to the land on which "it stands, in my judgment, unduly restrains the force of the "contract of the parties, and deprives the owner of the right "to reject an edifice not in substantial conformity with its "terms. If thereby any apparent injustice seems done to the "builder, in retaining the materials put upon the property, it "is the result of his own default, to which he must submit.

"Such acceptance by the owner may be express, or implied "from his conduct. It seems well settled that mere occupancy "of the building by the owner, while appropriate, is neither "presumptive nor conclusive evidence of acceptance. The "reason is obvious. The building belongs to the owner of "the land on which it stands. As was said by Lord Campbell "in Munro *vs.* Butt, the owner cannot be appropriately said "to take possession of the building, for he has not been out of "possession of that which is thus affixed to his own land."

The jury in the court below having found that the building had been accepted by the owner, it seemed, on the theory of the Supreme Court, that the contractor was entitled to recover something; but the judge said that the deduction of $300 from the plaintiff's claim, which the Court below made, was not large enough in view of the circumstances, and a further deduction must be made of $3,000, with interest from the time that the building was to have been completed, amounting in all to $4,790. If the plaintiff, he said, would remit $4,790 of the verdict which he had obtained in the court below, it might stand for the remainder.

In Maryland, as in New York and New Jersey, the stricter view of the law seems to prevail. The Hoopes Artificial Stone Company [1] agreed to cover a church with artificial stone, warranted not to come off, and to be of a gray color, like a certain sample. The work was done, but the coating proved not to be like the sample, and was streaked and spotted. The church people refused to accept or pay for the work; and the Supreme Court held that they were not bound to do so.

In New England, as has been before observed, the law is, in theory, more favorable to people who fail to comply with building contracts. A contractor in Connecticut [2] agreed to build a church according to certain plans and specifications. Partly by his error, and partly by that of the architect employed by the church, the ceiling was made two inches lower than the plans required; the windows were made shorter and narrower; the seats were made narrower, and there were other variations of minor importance from the contract. The church authorities called attention to these changes and objected to them, but occupied the building when it was done; claiming, however, that a deduction should be made from the contract price equal to the cost of making the structure conform to the plans and specifications. This would involve almost the entire rebuilding of the church, and the contractor appealed to the courts. The inferior Court decided practically in favor of the contractor, holding that he was entitled to receive the contract price, deducting from it, not the cost of making the building conform to the contract but only the amount of the diminution in the value of the building due to the deviations from the contract. The case was appealed to the

[1] Presb. Ch. *vs.* Hoopes, 66 Md. 598.
[2] Pinches *vs.* Swedish Luth. Ch., 55 Conn. 183.

Supreme Court, and was finally decided by a majority of the full bench, three judges holding that the decision of the Court below was correct, and two dissenting.

The judge who delivered the decision said in explanation of it, "In cases where only some additions to the work are required to finish it according to the contract, or the defects "in it may be remedied at reasonable expense, it seems proper "to deduct from the contract price the sum it will cost to "complete it." But the judge said, "In the present case, the "result of the plaintiff's labor and materials is a structure "adapted to the purpose for which it was built, but which "cannot be made to conform to the special contract except by "an expenditure which would probably deprive the plaintiff of "any compensation for his labor."

In a previous Connecticut case,[1] decided by the Supreme Court, the Court laid down the law as follows: "If a contract "is carried out in good faith, but with deviations from the specification, the builder can recover to the extent of the benefit "conferred, having regard to the contract price for the entire "work"; and the reporter in another case amplified this statement of the law by adding that, "this means, deducting from the contract price what it would cost to make the work comply with the contract; or, if that is difficult or impracticable, deducting a fair valuation of the reduced value, with damage shown to have been suffered."

The principal Massachusetts case [2] of the kind is Hayward *vs.* Leonard, which was decided in 1828, but has served ever since as the precedent to be followed by the Massachusetts courts. In this case, the Chief Justice, Parker, laid down the law as follows: "The point in controversy seems to be this: "whether, when a party has entered into a special contract to "perform work for another, and to furnish materials, and the "work is done, and the materials furnished, but not in the manner stipulated for in the contract, so that he cannot recover "the price agreed by an action on that contract, yet nevertheless the work and materials are of some value and benefit to "the other contracting party, he may recover on a *quantum* "*meruit* for the work and labor done, and on a *quantum valebant* for the materials. We think the weight of modern "authority is in favor of the action, and that on the whole it "is conformable to justice that the party who has the possession and enjoyment of the materials and labor of another "shall be held to pay for them, so as in all events he shall lose "nothing by the breach of contract. If the materials are of a "nature to be removed, and liberty is granted to remove them, "and notice to that effect is given, it may be otherwise. But "take the case of a house or other building fixed to the soil, "not built strictly according to contract, but still valuable, and "capable of being advantageously used, or profitably rented — "there having been no prohibition to proceed in the work "after a deviation from the contract has taken place — no absolute rejection of the building, with notice to remove it from "the ground; it would be a hard case indeed if the builder could recover nothing.

"And yet he certainly ought not to gain by his fault in violating his contract, as he may, if he can recover the actual "value; for he may have contracted to build at an under price, "or the value of such property may have risen since the contract was entered into. The owner is entitled to the benefit "of the contract, and therefore he should be held to pay in "damages only so much as will make the price good, deducting "the loss or damage occasioned by the variation from the contract."

In a case in Vermont,[3] a man agreed to build a wall, of certain dimensions, at a given price. A part of the wall was not built to the height stipulated, and the owner refused to pay anything for it. The Supreme Court held that the contractor was entitled to the contract price, less the cost of making the work conform to the contract, and any additional damage caused by the contractor's failure to comply with the agreement.

In California, the curious conclusion has been arrived at that the two views of the law set forth in the preceding portions of this chapter are really harmonious. In an action for the contract price of labor and materials, the Court below instructed the jury [4] that if the defendant received any benefit from the work he was liable to the extent of the benefit he had received; deducting from the contract price any damage that he might have sustained by omissions or defects in the work; and that if he was injured more than he was benefited, or was not benefited at all, by reason of such defects or omissions, the jury should find for him; and it gave another instruction, that if the plaintiff and defendant had entered into a contract the plaintiff must show a substantial compliance with the terms of the contract on his part before he could recover. The defendant's counsel appealed from the decision of this Court, on the ground that the two instructions given to the jury were inconsistent with each other; but the Supreme Court held that they were not inconsistent, and, together, they stated the law correctly.

THE COURTS ON LOCAL CUSTOMS.

There are a few more cases, which may be considered under this head, in which the question to be decided relates to the work which the law assumes to be included in a building contract, where the specifications and plans are silent on the subject.

In most instances, the answer to this question is determined by local custom, but, as has been before mentioned, custom, to have the force of law, must not only be generally known to persons engaging in building contracts, but must be reasonable in itself.

In Missouri,[5] a custom has been proved and accepted by the Supreme Court, that, in measuring stonework for the laying, doors and windows should be measured solid and corners twice, and a decision given accordingly in a suit by contractors for their pay.

In Maryland,[6] the same custom has been proved and accepted, with the additional one, that curved work should be measured at one and one-half times its actual length; but it is unsafe to rely too much upon the legal validity of customs in the trades, which, as architects know, often vary greatly in different towns in the same State.

In New York,[7] a plaintiff was allowed to prove in the lower court that it was the custom in Buffalo for plasterers to charge for the full surface of walls to be plastered, without deduction for baseboards, cornices, or doors and windows; and evidence that

PLASTERERS' MEASUREMENT.

the defendant had no knowledge of this custom at the time of contracting was excluded. The defendant's counsel appealed, claiming that that evidence in regard to the custom should not have been admitted; that the custom was unreasonable in itself, and that the defendant ought to have been allowed to testify that he had no knowledge of it when the contract was made. The Court of Appeals held that the evidence of the custom was proper, and that the custom itself not unlawful or unreasonable, and raised a presumption that the defendant contracted with reference to it. As to the direct testimony of the defendant, that he did not know of it, however, the Court held that it ought to have been admitted, one judge dissenting.

On the other hand,[8] it has been held in Pennsylvania that "A custom of plasterers to charge half the size of the windows at the price agreed upon for work and materials is unreasonable and bad."

In Tennessee [9] a man agreed to pay $8.00 per thousand for brick "in the wall." A controversy arising about the payment, evidence was offered that it was the custom among masons to determine the number of bricks in a wall by measurement, rather than by counting. This evidence was held by the Supreme Court to be inadmissible.

In a Massachusetts case,[10] a man contracted to build "two brick dwelling-houses," to be similar to a certain other house. The "certain other house" had a wooden extension kitchen,

"A BRICK HOUSE."

and the contractor refused to build similar extensions to the new houses, on the ground that they were not included in his contract. The question, which certainly presents some difficulty, was brought before the Supreme Court, which decided

[1] Blakeslee *vs.* Holt, 42 Conn. 226. *See, also*, Smith *vs.* Ridge Sch. Dist., 20 Conn. 318. Sch. Dist. *vs.* Dauchy, 25 Conn. 530.

[2] Hayward *vs.* Leonard, 7 Pick. 180. *See, also*, 1 Stephens N. P. 306. Thornton *vs.* Place, 1 Mood. & Rob. 218. Moulton *vs.* McOwen, 103 Mass. 591. Smith *vs.* Lowell Cong. Ch., 8 Pick. 177. Powell *vs.* Howard, 109 Mass. 192. Veazie *vs.* Hosmer, 11 Gray, 396. Walker *vs.* Orange, 16 Gray, 193. White *vs.* Quincy, 97 Mass. 430. Blood *vs.* Wilson, 141 Mass. 25. Yeats *vs.* Ballentine, 56 M. 530. Eyerman *vs.* Mt. Sinai, 61 M. 489.

[3] Gilman *vs.* Hall, 11 Vt. 510. *See, also*, Dyer *vs.* Jones, 8 Vt. 205. Merrow *vs.* Huntoon, 25 Vt. 9. Joslyn *vs.* Merrow, 25 Vt. 185.

[4] Hunt *vs.* Elliott, 77 Cal. 588.

[5] Haynes *vs.* Second Baptist Ch., 88 Mo. 285; Fitzsimmons *vs.* Christian Brothers, 81 Mo. 37.

[6] Patterson *vs.* Crowther, 70 Md. 124.

[7] Walls *vs.* Bailey, 49 N. Y. 464.

[8] Jordan *vs.* Meredith, 3 Yeates, 318.

[9] Sweeney *vs.* Thomason, 9 Lea, 359.

[10] Ricker *vs.* Cutter, 8 Gray, 248.

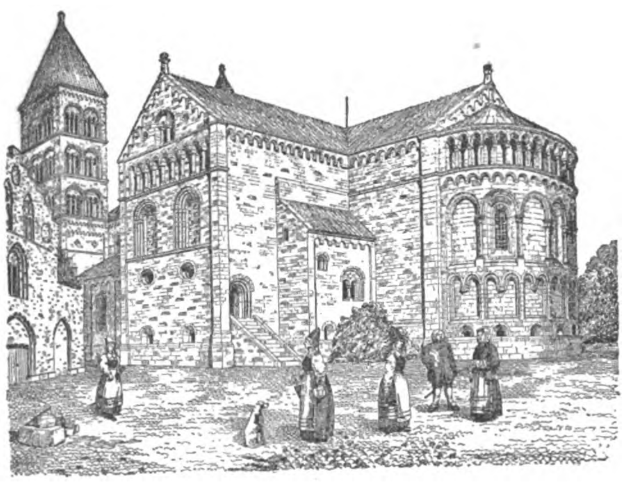
that wooden extensions, such as existed in the house specified as the model, were to be regarded as included in a contract for brick dwelling-houses.

A New York contract[1] provided that "the provisions of the building-law will be complied with in the construction of the buildings herein described, whether the same are herein specified or not." It turned out that the law required the erection of fire-escapes on the buildings, although nothing was said about them in the specifications; and the Supreme Court decided that they were included in the contract. A very similar decision has been given in Pennsylvania.[2]

It is quite common for architects to stipulate in their contracts that the contractor shall comply with all the directions of the Inspector of Buildings, or his deputies, and that these directions shall be regarded as part of the contract. As these directions have not been given at the time of signing the contract, and no one knows what they may be, it is sometimes claimed by the amateurs of fine-spun theories, in regard to matters of law, that they cannot form a part of the subject-matter of a contract, and that the stipulation referring to them is void. The Courts, however, hold a different opinion. A firm once contracted for some railroad work,[3] including the stations, which were to be built "after such plans and dimensions as may be adopted by the engineer." Preliminary plans were shown for the stations, as well as for the other work, at the time of the signing of the contract. When the time came for building the stations the engineer called for larger and more expensive buildings than those shown in the preliminary drawings, and the contractors claimed additional pay for them. The Supreme Court of Connecticut held that the contractors took the risk of deviations by the engineer from the original scheme in this, as well as other particulars, and, no bad faith being shown toward them, they were not entitled to extra compensation.

(To be continued.)

THE GOVERNMENT BUILDINGS BILL.



Lund Cathedral, Sweden.

AT the meeting of the Board of Directors of the American Institute of Architects, recently held in Washington, a portion of the duties of said Board consisted of a meeting, by appointment, with the committee on Public Buildings and Grounds of the Senate, for the purpose of urging, at this session of the Congress, the passage of House Bill No. 9592, a copy of which was published in the *American Architect* for January 21.

Owing to the death of Senator Kenna, which took place while we were in Washington, and the indisposition of the acting chairman of the committee, Senator Morrill, and, after waiting two days, we were enabled to secure a hearing with but one member of the committee, Senator Pasco, of Florida, to whose courtesy and kind attention we are greatly indebted.

At the suggestion of members of the Board and by the direction of the president, Mr. Kendall, it was decided to mail to members of the profession in each State copies of the bill and such other matter as seemed pertinent, with the request that they in turn forward it to the Senators of their respective States, urging upon them the desirability of its passage. It is impossible with the time at command to communicate with all who would be glad to lend a helping hand, but it is hoped those who receive these papers will call the attention of their fellows, and such others as may be possessed of influence, to the matter, with a request for their coöperation.

It is particularly desirable that those who receive this circular who reside in the States represented by Senators who compose this committee, or any who are able to bring influence to bear upon them, should communicate with them at once, urging favorable consideration on their part, to the end that the bill may not be lost in committee. The influence of prominent men not members of the architectural profession would be of value in this connection.

The importance of this matter cannot be too strongly urged. The present Congress expires on March 4, and, in case of failure, will require the entire work to be done over again in both House and Senate. It is believed that, should the bill under consideration become a law, it will be the entering wedge to a better order of things, and with such modifications of it as will naturally arise there will be inaugurated a system by which the Government will secure a class of work that will compare favorably with that executed by foreign governments, and in which the whole nation can take pride.

Should additional copies of these papers be desired, they will be forwarded to any address, by request, to the undersigned.

The following named Senators compose the Committee on Public Buildings and Grounds:

LELAND STANFORD, of California.
JUSTIN S. MORRILL, of Vermont.
MATTHEW S. QUAY, of Pennsylvania.
WATSON C. SQUIRE, of Washington.
JOSEPH M. CAREY, of Wyoming.
GEORGE G. VEST, of Missouri.
JOHN W. DANIEL, of Virginia.
SAMUEL PASCO, of Florida.
CALVIN S. BRICE, of Ohio.

Yours truly,

GEO. B. FERRY, *Secretary, pro tem*, A. I. A.

ERECTION OF PUBLIC BUILDINGS.

HOUSE OF REPRESENTATIVES, 52D CONGRESS, *1st Session*, REPORT NO. 1078.

APRIL 14, 1892. — Committed to the Committee of the Whole House on the state of the Union and ordered to be printed.

Mr. Tarsney, from the Committee on Public Buildings and Grounds, submitted the following report: [To accompany H. R. 8152.]

The Committee on Public Buildings and Grounds, to whom was referred House Bill 261, make the following report, and submit the accompanying substitute [H. R. No. 9592] for said bill, and recommend the passage of the same for the following reasons:

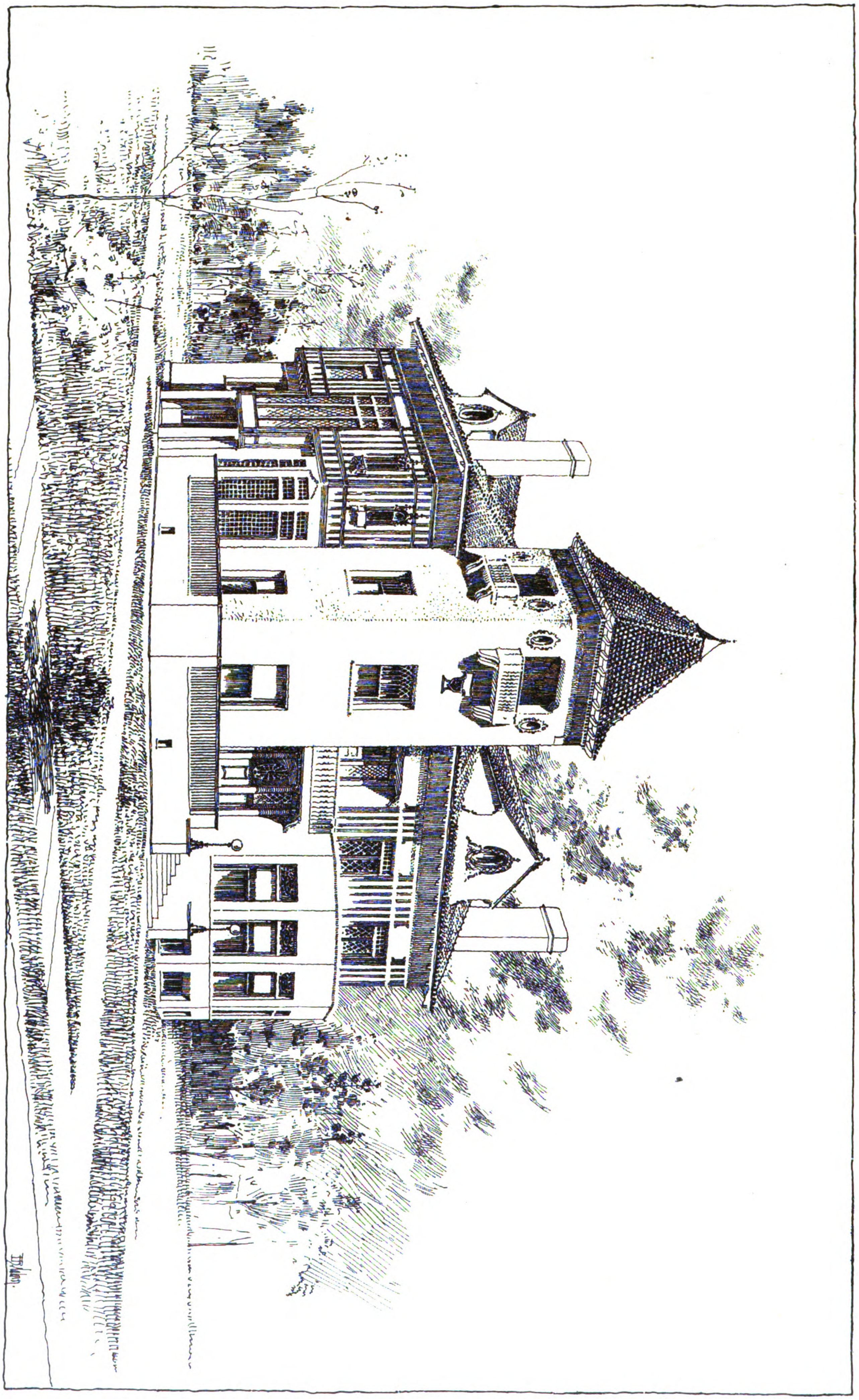
The United States Government has at this date nearly three hundred public buildings in the various stages of progress, of planning and construction, all under the supervision and control of the Supervising Architect of the Treasury, and from fifty to sixty new buildings are authorized to be constructed by each Congress. To carry on these works and to provide for the construction of these buildings many millions of dollars are annually appropriated and expended. For the expenditure of the moneys thus appropriated, as for the expenditure of moneys appropriated for any other public purpose, methods should be adopted which will secure the largest degree of utility from and economy in the application of the moneys expended. Your committee do not believe that these results and other beneficial results that should be obtained are obtained under the existing methods for planning and constructing the public buildings of the United States.

While the employment of the best artistic thought, the best and most approved systems of construction and equipment, and the utmost development of structural economics ought to be represented in the public edifices of this great nation, the contrary of these propositions is the result obtained under existing methods.

Your committee are advised that the best and highest types of artistic thought and architectural skill, producing the greatest development of structural economics in European countries, is found in the government buildings of those countries; that such government buildings, in artistic design, if not in economy of construction, surpass those erected by municipal or private enterprise, while in this country the reverse is the rule, and superiority of architectural design and economy of construction are represented in State, municipal, and private buildings, and not in those erected by the General Government.

A comparison of modern municipal buildings in our great cities, and business buildings erected by private citizens and corporations in such cities, with those belonging to the Government of the United States, will show, as to the former, constant progress in construction, equipment, and artistic expression, and that this progress has been accompanied by a continual increase in economy of construction, while in the case of the buildings of the United States there has been but little, if any, advance upon methods of construction or equipment in recent years; in fact, the buildings constructed recently by the United States, as compared with those constructed a quarter of a century ago, show a marked deterioration of artistic

[1] De Kay *vs.* Bliss, 42 Hun, 659.
[2] Mittnacht *vs.* Wolf, 6 Pa. (St.) 44.
[3] Cannon *vs.* Wildman, 28 Conn. 472.



•DESIGN•FOR•A•COLLEGE•FRATERNITY•CHAPTER•HOUSE•

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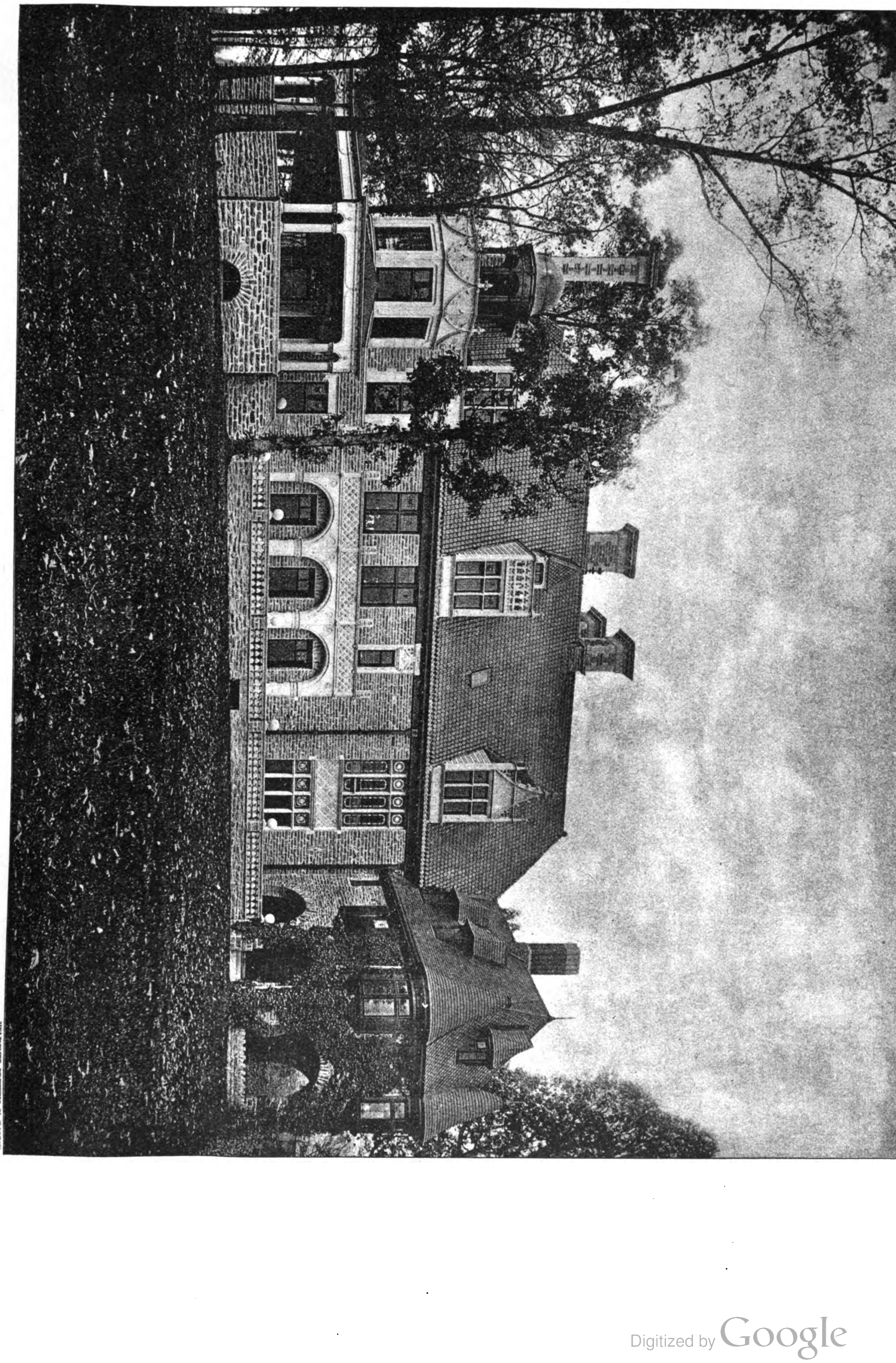

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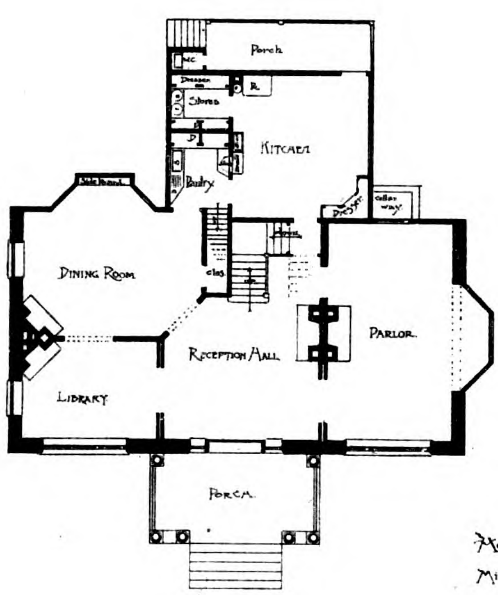
• HOUSE • OF • J • B • STETSON • ESQ. • OGONTZ, PA. • • George • T • Pearson • Archt. •

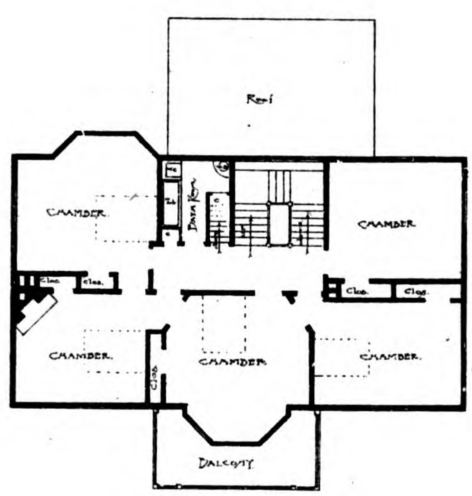
No. 894 American Architect and Building News, Feb. 11, 1893.

HOUSE AT CYNWYD, PA.



Plan of First Floor

House at Cynwyd Pa.
Minerva Parker Nichols Archt.
Philada Pa.



Plan of Second Floor

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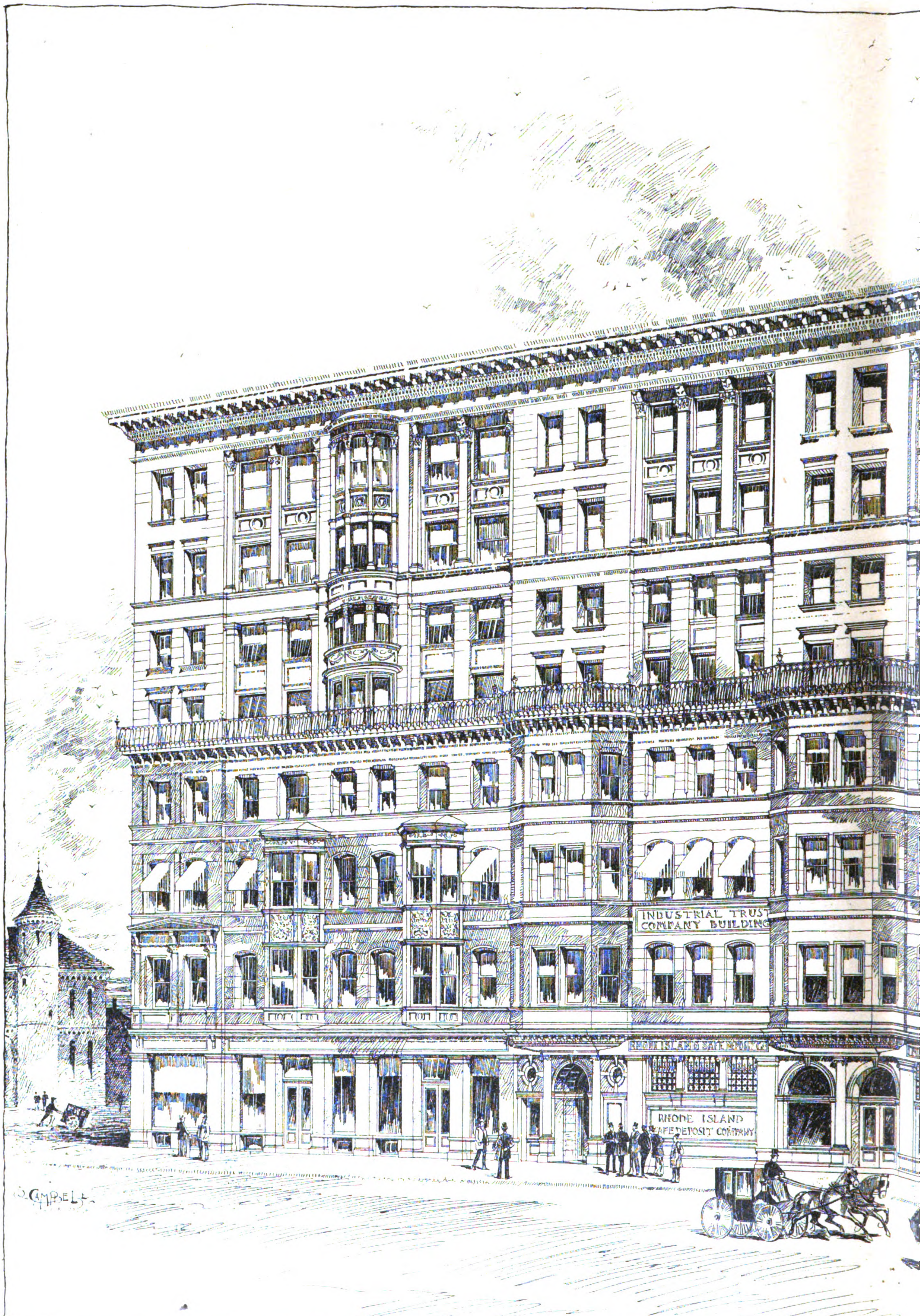
AMERICAN ARCHITECT AND BUILDI



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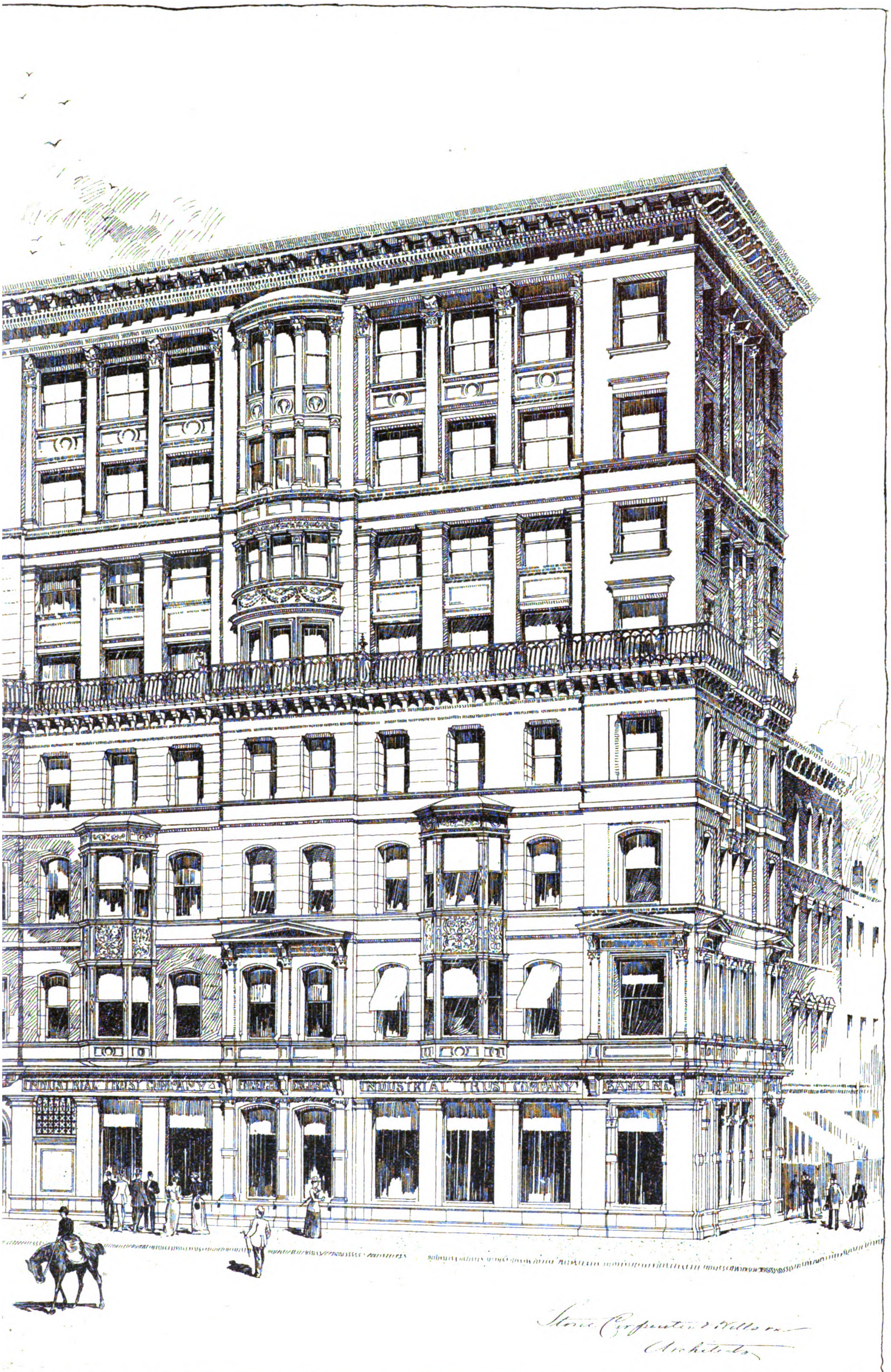

MPANY BVILDING,
E, R.I.
WILLSON, ARCHITECTS.

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quality; that, despite the marked inferiority of the typical Government buildings, the cost has been relatively and positively much greater than that of private buildings of the best type.

Your committee has been furnished reliable and trustworthy information and data showing that the cost of the best types of buildings constructed for States, municipalities, corporations, and private citizens ranges from thirty-eight to fifty cents per cubic foot of space, while the cost of the buildings constructed by the United States ranges from fifty cents to one dollar per cubic foot.

Thus it is demonstrated that the Government of the United States, in the methods it employs, does not avail itself of the best and most approved systems of construction or utilize the developments of structural economics, and when we add that it does not employ the best artistic thought in the design of its structures to make such structures to serve as models and standards of excellence and superiority for the works of private ownership, but that such designs and plans fall so far behind the standards of the age that they are obsolete almost before they are drawn, and are always wasteful and extravagant, it is not surprising that it requires double the expenditure by the Government that is required to be expended by the private citizen to obtain like structural space results.

The conditions and results to which your committee thus call your attention are the conditions and results which necessarily follow the methods and practices now employed by the Government in planning and constructing its buildings, and in no respect gives warrant for criticism of, or for impugning the capability or integrity of, the officers of the Government charged with the responsibility for such works.

The office of Supervising Architect of the Treasury was established at a time when but a few buildings were constructed by the Government annually, when the planning and general supervision of such few buildings were easily within the scope of the capacity of one man, and the purpose of the Government in creating the office was to obtain the exclusive benefit of the artistic skill and scientific knowledge of one learned and eminent in the profession of architecture for the planning of the buildings to be erected for its use. The main purpose in the creation of the office was that its incumbent should be the artistic designer of such buildings.

If by the development of conditions, methods, and practices it now transpires that the time of the Supervising Architect is wholly employed in matters of administrative detail, matters pertaining to contracts for construction or with details relating to the actual construction of buildings, and the architectural work of the office, the plans, designs, and specifications are prepared by mere copyists, cheap clerks, such was not the intention of Congress when the office was created. It was to obtain architectural skill in the designing of buildings; to obtain and utilize artistic thought, not mere mechanical or clerical skill, that a supervising architect was wanted. It was not intended that, as now, clerks and copyists should do the work of the learned architect, and that the learned architect should be occupied with the work of clerks and copyists. Yet this is the present condition of the conduct of the work of that office, and it is necessarily so. It need not be urged that it is physically impossible for one man to devote sufficient thought and time to the proper designing and preparation of plans and specifications for fifty or sixty buildings each year which in their artistic expression shall be creditable to the nation, to the age, and to the architectural genius of the country, and that, in the economy of construction, shall do justice to those from whom the cost of such construction is drawn.

How much of the time of the Supervising Architect may be devoted to the work of designing and preparing the plans for buildings may be conjectured when the amount of administrative work devolved upon him under the present methods is understood. The volume of work thrown upon him relating to repairs, maintenance, and alterations of existing buildings alone is far greater than was the entire business of the office twenty-five years ago. In addition, every matter of detail relating to contracts for or the construction of new buildings, the appointment of and correspondence with local superintendents of such buildings, has to receive his personal attention, as well as the administrative control of the large force of employés in the office. The Supervising Architect cannot himself design and make original plans for each new building. This condition necessitates that the plans and specifications must be prepared by clerks in the office, who possess no architectural skill or learning, and this results in the production of plans and specifications by the simple system of copying the drawings and specifications of a structure constructed in one locality to be used as the design for another in a different locality, and this regardless of the difference in geological or atmospheric conditions or space requirements, this resulting in the most wanton wastefulness of expenditure, and absolutely precluding the possibility of progress in architectural design.

The Supervising Architect rarely ever sees one of these buildings while in course of erection. Its construction is generally under the supervision of some local carpenter or builder who never made any pretence to architectural knowledge or study, and whose appointment was secured, not because of his skill or knowledge of the work, but because of the political influence he could marshal to secure him employment, and whose greatest solicitude is to prolong the tenure of his employment by delaying the completion of the work.

Another very serious evil resulting from the system and methods now employed relating to the construction of public buildings, to which the committee would call your attention, is the length of time required to construct and complete one of these buildings. A building which, if the property of a private citizen, would be constructed in months, when erected by the Government requires years for its completion. This necessarily results in great wastefulness and loss of money to the Government by the payment of unnecessary salaries of superintendents and other agents, by the expense of watching and caring for the materials and structure, and by the loss, waste, and deterioration of such material, besides the inconvenience to the citizens resulting from such delayed construction. From three years upward is the time employed in constructing a building that a private citizen or a corporation would complete in one building season.

As an illustration of the extent to which this evil may extend under present methods, your committee would call your attention to the last annual report of the Supervising Architect in relation to the public building at Detroit, Mich., where the construction was authorized eleven years ago, and $1,300,000 therefor has been appropriated by Congress years since, and the foundation walls are not yet completed. Indeed, the abuses in the method above referred to have become so serious that the committee cannot conscientiously recommend public buildings at many places where the economical and convenient transaction of the business would require or justify such buildings could they be provided at a cost not greatly exceeding the necessary expenditure by a private owner for similar purposes. Of the bills reported from this committee during the present session, many are so reported only on the assumption that the buildings contemplated can be erected under some plan less wasteful than that now in operation.

The scope and purpose of the measure herewith presented is designed to remedy the many evils herein pointed out. To give to the country a better type of architecture in its buildings, and to stop the wasteful extravagance that is the necessary result of the present methods, a system that is universally approved by the best business men and by the best-managed corporations of the country should be a good system for the Government if its adoption is practicable. This measure authorizes the employment of such approved system. It authorizes the Secretary, in his discretion, to obtain plans and specifications and local supervision for its public buildings by the system of competition among private architects. While not mandatory, it authorizes the Secretary to employ the architect whose plans are approved to superintend the construction. It is to be presumed that this will secure the best architectural ability in the formulation of plans and the construction of the work according to such plans; that the compensation of such architects will be determined, as in private employment, on fixed commission upon the cost of the work, and that this will secure speedy completion of the work.

The measure does not abrogate or take from the Supervising Architect any of the functions or authority belonging to the office which, under existing conditions, he is capable of performing. He will still, as now, retain general supervision and control of the work. He will remain and continue the representative of the Government in all matters connected with the erection and completion of the buildings, the receipt of proposals, the award of contracts therefor, and the disbursement of money thereunder, and perform all the duties that now pertain to his office, except the designing and preparation of drawings and specifications for such buildings, and the local supervision of the construction, and such drawings and specifications shall be subject to his approval and to modification by him.

In fact, this measure is intended to make him what the title of his office indicates, the Supervisor of Architects — not the Government's architect, but the supervisor of the architects of the Government's works.

Your committee, therefore, recommend that the accompanying substitute do pass.

[See the *American Architect* for January 21, 1893.]

ANECDOTE OF WERNER VON SIEMENS. — It may not be generally known that Von Siemens applied for his first patent from the cell of a prison. After graduation from the artillery school, in Berlin, the young man — then only twenty-one years old — was attached to a regiment in Wittenberg. It was there he began his experiments, to the great horror of his landlady, who upbraided him day after day for staining his clothes, furniture, and the window-panes with gold, silver, and acid spots. She could not see the use of "wasting money for such things." But Von Siemens went on with his experiments, and with staining his furniture and clothes. He became, too, the life of the garrison, and one of its most popular members. His popularity, however, led to his taking part as second in a duel between two of his comrades. As a result, he was sentenced to five years' imprisonment in the fortress of Magdeburg. The landlady was the only person in Wittenberg who was glad of the young lieutenant's departure. In the cell in the fortress, however, he was allowed to fix up a laboratory, and there continue his experiments. There, too, a month after his incarceration, he perfected his method of galvanic gilding and applied for the patent from the prison cell. It was granted, and with it a pardon. A pardon in all probability was never received with less glee. Siemens had other experiments under way in his prison workshop, and begged to be allowed to stay a while longer in prison to complete them. But the keeper sent him away, with the declaration that such a course would be an insult to his king and commander. Siemens then came to Berlin. — *New York Tribune.*

COMPARATIVE MUNICIPAL BUILDING LAWS. — XXI.

[*Note:* — In these tables bracketed letters invariably refer to preceding passages in the same column.]

Projections beyond Building Line.

Boston: — No bay-window or other structure, except fire-escapes, shall project over any public way or square without permission of Board of Aldermen, given after due notice and hearing, and then as approved by Inspector.

Baltimore: — No steps shall project beyond building line more than one-third width of foot pavement.

No column or bracket to form covering over steps shall project more than 2′ beyond building line.

No wall, pilaster or architectural ornament shall project beyond the building line.

Permit may be obtained to project show-window not exceeding 16″.

Bay-window fronting on street or alley may project 2′ beyond building line, and not exceed 10′ wide.

Bay-window on side of house and on first story shall not be less than 10′ from front building line unless 8′ above footway.

Bay-windows require special permit and fees.

Brooklyn: —

Charleston: —

Chicago: — *a*. Above main water-table of building, no wall, pilaster or column shall project beyond building line unless merely part of a portico, window or window dressing.

b. Porticos extending through one or two stories may have plinth extend 4′ beyond building line, but bay or oriel windows of dwelling-house shall not have bay project more than 3′, and no part of such windows shall be less than 8½′ above sidewalk.

c. Brackets projecting not more than 14″ to be kept 5′ above sidewalk.

d. Awnings attached to buildings shall have metal framework.

Cincinnati: —

Cleveland: —

Denver: — Projections allowed above first story, not exceeding 3′ for balconies and bay-windows; the number and width of latter to be approved by Inspector. No other projections, except for open areas.

Detroit: —

District of Columbia: — Maximum projection: *Upon any street or avenue 80′ or more in width:* Areas, 8′ on parked street and 6′ on unparked streets; show-windows, 3′; bay-windows and tower projections, 5′ on parked streets and 4′ on unparked streets; steps, 9′ for unparked streets and 12′ on parked streets, unless otherwise determined by Inspector.

On streets less than 80′, projections not to exceed 4′.
" " " " 70′, " " " " 3′.
" " " " 50′, " " " " 2′.

In no case shall projections leave less than 10′ of clear sidewalk, except by special permit.

Fireplace or chimney projecting beyond building line shall have shaft return to building line, and carried on iron beams.

Bay-windows and tower projections shall not exceed 14′ in width unless approved by Commissioners. On buildings 15′ or less than 15′ wide, the building line must be preserved by not less than 2′ 6″; on buildings 15′ to 20′ wide, by 3′ 6″; on buildings from 20′ to 35′ wide, by 4′ 10″, spaced as approved by Inspector. Only one projection allowed on building 35′ or less in width. On larger fronts, the projections shall not exceed fifty per cent of principal or entrance front and forty per cent on a side front, exclusive of corner tower projections.

Colonnades not to exceed 6′ from building line may be built on Pennsylvania Ave.

No projections, except corner towers, show-windows and areas, shall be constructed on Pennsylvania Ave. between 7th St., E., and Rock Creek; on 7th St., W.; on 9th St., W., between B St., N., and New York Ave.; F St., N., between 6th and 15th Sts., W.; and D St., N., bet. 6th and 12th Sts., W.

All projections must be approved by Inspector.

Porte cochères may be constructed in manner determined by Inspector and approved by Commissioner.

Kansas City: — No bay-window or other structure shall project over any public way or square; but bay or oriel windows may project not exceeding 18″ over street line, provided no part is less than 12′ above sidewalk grade, and constructed of or covered with non-combustible material, and strongly built and approved by Superintendent. No steps or columns to project over building line.

(*d*) and lower part not less than 8′ above pavement, and curtain shall not hang more than 8″ below.

Louisville: — (*b*). Brackets projecting not more than 14″ shall be kept at least 6′ 6″ above grade of sidewalk.

Face of wall, pilaster or column of any building above first-water table shall not project beyond property line unless merely part of bay or oriel window.

Memphis: —

Milwaukee: — No porch, gallery, stoop, platform, bay-window or stairs shall extend over lot line, except above the first story, and in no case more than 3½′.

Minneapolis: — (*a*). Porticos extending one or more stories may have plinth extend 3′ over street line. Bay or oriel window shall have body not project more than 3′, and no part less than 12′ above sidewalk grade in business building, and not less than 8½′ in dwelling-house.

(*c*); (*d*). No bay-window shall be allowed within 4′ of any party-wall, nor in any alley, nor project into any street less than 50′ wide.

Nashville: —

Newark: —

New Orleans: —

New York: —

Omaha: — No structure except fire-escapes shall project over any street or alley without permission of City Council, and as approved by Superintendent.

Philadelphia: — Bay or oriel windows shall not project from first-story front wall, nor from other walls, except within lines drawn from intersection of party line and building making angle of 20° with former and within 4′ of latter. No bulk window shall project more than 1′ beyond building line.

Pittsburgh: — No roof shall project farther than necessary for a reasonable cornice. No out-stairs, out-shots or other structure shall overhang any street, lane, alley, public square or pavement, and no jut or window or other encumbrance shall incommode passage of pavement, footway, street, square or alley. (See "*Cellar.*")

Providence: —

St. Louis: — No part of building shall project beyond building line, except balcony on second floor not projecting more than 3′, or a portico or balcony at main entrance or theatre or opera-house constructed with iron columns and approved by Board of Building Inspection.

San Francisco: — No bay or oriel window shall project over street line more than 3′ or more than 9′ wide, nor have bottom less than 13′ above sidewalk, nor be constructed upon any street or place less than 35′ wide.

Swell fronts shall have walls entirely of fireproof material, and no bay or oriel window shall project from swell front.

In frame buildings, piers or spaces between bay or oriel windows shall not be less than 5′.

In brick buildings, of two stories, piers or spaces between bay or oriel windows shall not be less than 6′; *of four stories*, not less than 8′.

No bay or oriel window shall be more than four stories in height above sidewalk, nor erected on the corner of a brick building.

In brick buildings, joists of bay-windows shall be supported on iron lintels at each story, lintels full width of wall, and resting 8″ on each jamb; and top of opening covered with brick or stone arch, and the exterior framework covered with fireproof material.

Wilmington: —

Shafts for Elevators, etc. — Construction.

Boston: — *a*. All shafts for elevators, hoists, dumb-waiters, lifts, light, ventilation or other air-ducts shall (with exceptions as hereafter given) be constructed of substantial, uninflammable material.

b. Tops of such shafts *which do not pass upper floor* shall also be covered with such material.

c. *Exception.* — Elevators or hoists for freight *which do not pass ceiling of first story* may be constructed without fireproof enclosure above basement.

d. *Exception.* — Elevators without fireproof enclosure may be placed *in areas or hallways which are continuous*, no part being separated by an intervening floor, *provided* no additional draught is thereby created.

e. *Exception.* — Such elevators may pass through first floor of any area or hall, *provided* fireproof enclosure is carried up to first floor.

f. Such shafts that do pass top floor shall be carried at least 18″ above roof, and be covered with skylight.

g. Such shafts already constructed, *except in dwellings occupied by not more than one family, and except shafts for lifts with areas of* 28″ *square or less*, shall be lined with tin or plastered on wire lathing, or otherwise rendered non-inflammable on inside.

h. Such shafts hereafter built for passenger or freight elevators shall be of brick at least 8″ thick, or of metal covered on both sides with at least 1″ thick mortar applied immediately to metal, or with some other equally substantial, non-inflammable, non-conducting material.

Baltimore: —

Brooklyn: —

Charleston: —

Chicago: — *i*. Hoistways in which elevators are used shall be constructed entirely of brick from lowest point to, and extending through and 6′ above roof. (See "*Protections for Shafts.*")

j. Area of light and air-shafts for habitable rooms must be, *for three-story house*, at least 12 square feet; *for four-story house*, at least 16 square feet; *for five-story house*, at least 20 square feet.

k. In every case, at least 2′ wide in clear. Shafts between two houses at least double those areas, and be at least 4′ wide.

l. *When sides of shafts are of studding*, they shall extend above roof at least 3′, be covered with glass to admit light, and have openings protected with slats to admit air, such openings to have area as great as that of shaft.

m. Open passenger elevators within well-hole of open stairs not prohibited.

Cincinnati: — *n*. All elevators shall be enclosed within walls of incombustible material if Inspector judges necessary, or with substantial stud partitions covered with metal lathing and three coats of plaster on each side, and such walls carried through roof.

o. Roofs over such elevator-shafts to be formed with skylight; area of sheet-glass at least half area of skylight.

p. Elevators placed in well-holes of stairways shall, together with stairs and landings, be built of fireproof material.

(*j*); never less than 3′ wide in clear.

q. Shafts common to two houses double those areas.

Cleveland: — (*n*); (*o*); (*p*); (*j*), never less than 3′ in clear width; (*q*).

Denver: — Elevator cars and hoists (except lifts less than 30″ square, and those in dwellings) shall run in shafts with brick walls not less than 8″ thick, or walls covered with incombustible material and tin stops, or in well-room of fireproof stairway enclosed in like manner, and carried up through roof at least 18″; said shafts covered with ventilating skylights.

Detroit: — Elevator shafts shall have brick walls at least 8″ thick, commencing at lowest point reached by elevator, and extending at least 5′ above roof of building.

District of Columbia: —

Kansas City: — Excepting for lifts 28″ square or less, and those in dwellings, *r*. Elevator cars and hoists shall run in shafts with brick walls at least 8″ thick, or walls covered with incombustible material, with proper fire-stops, or placed in well-room of fireproof stairway. Shafts provided with ventilating skylight.

s. Special permits may be given by Board of Public Works for freight elevators in warehouses without brick shafts.

Louisville: — Elevator-shafts shall be fireproof from lowest point at which elevator starts, the fireproofing extending at least 6′ above roof.

Well-holes for stairways may be used for elevators, with latter enclosed in wire netting.

Memphis: —

Milwaukee: —

Minneapolis: —

Nashville: —

Newark: —

New Orleans: —

New York: — Elevators (except in fireproof buildings, Sec. 492 of law) shall be enclosed in suitable walls of brick, or framework of iron with burnt-clay filling, or such other fireproof material and form of construction approved by Superintendent.

Such construction shall extend through and 3′ above roof. Elevators may be placed in stair-well holes without fireproof enclosure if stairs are enclosed in brick or stone walls, and the stairs entirely constructed of stone, brick, iron or slate.

Elevators may be placed in stair-well or open court in building erected before passage of this law, under permit from Superintendent and approval of Board of Examiners, but framework and enclosure of the elevator must be fireproof.

Foregoing requirements for fireproof shafts apply to dumb-waiters in dwellings which extend through more than three stories.

Roofs over all elevators shall be of fireproof material, with skylight at least three-quarters area of shaft, made of glass set in iron frame.

All walls and partitions forming interior light-shafts shall be built of fireproof material approved by Superintendent.

Walls of all light-shafts, interior or exterior, shall be carried at least 3½′ above level of roof.

Omaha: — (*r*).

Philadelphia: —

Pittsburgh: —

Providence: —

St Louis: —

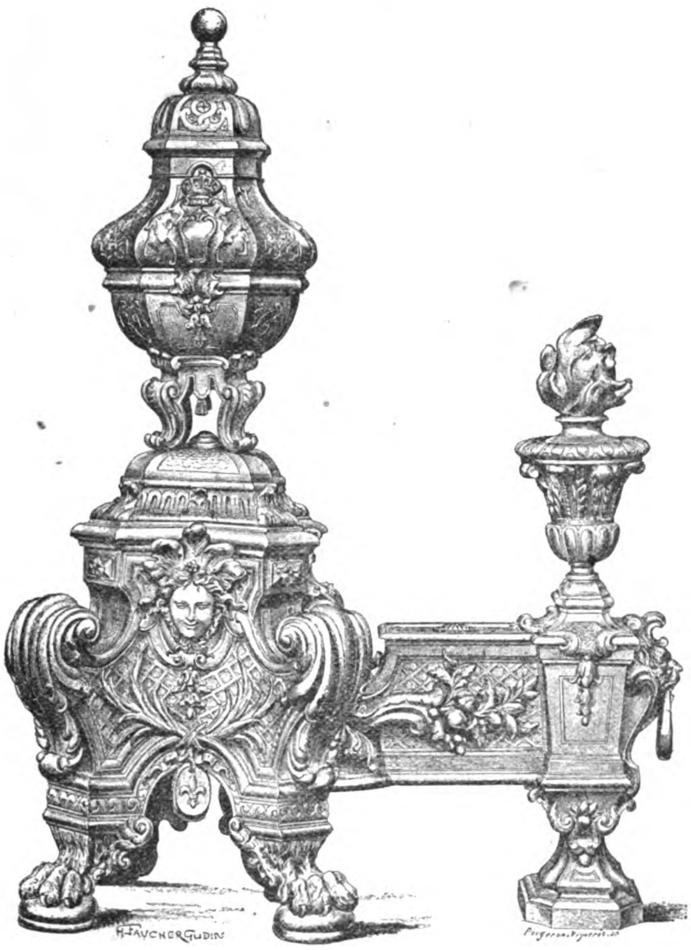
San Francisco: — Passenger elevators shall run in shafts with walls at least 12″ thick, or of substantial framework, with each side "covered with smoke-proof iron laths," and finished with three coats of mortar. Shaft to pass through roof at least 3′, and covered with ventilating skylight glazed with glass not less than 3-16″ thick.

Light-shafts shall be formed with substantial framing, both sides "covered with smoke-proof iron laths," and finished with three coats of mortar. (*m*) if stairways are fireproof.

Wilmington: —

Compiled by HENRY A. PHILLIPS.

THE DUTIES AND RESPONSIBILITIES OF ARCHITECTS.[1]



Bronze Fire-dog: designed by M. Morisot. From *L'Art pour Tous.*

THERE have been so many decisions by the courts affecting the position of architects, that by drawing attention to this subject, and some of the principal cases decided, I may give, at any rate to the younger members of this body, some useful information, and be of assistance in our practice. It is proposed to divide the subject into three general heads, and to consider the duty and responsibility of the architect in connection with each as follows, viz,: 1st, the design of the structure; 2d, the supervision of its erection; 3d, the granting of certificates. Other points will be touched upon in the consideration of the matters arising under these heads, such as the authority of the architect to order variations, authority to order bills of quantities to be prepared, and other incidental matters; but the subdivisions adopted are sufficiently defined for the present purpose.

First, then, the responsibility of the architect in the preparation of the design: An architect is responsible for any errors in the preparation of the plans whereby the building-owner suffers damage. In other words, an architect in designing a structure is bound to act in a skilful and careful manner, so that, so far as can be foreseen by the exercise of care and skill, the building, if erected, shall carry out the purpose for which it is intended, in an efficient manner.

There is not, however, any implied warranty on the architect's part that his work is actually correct, nor can the architect be held liable for errors which might arise, providing he has exercised reasonable care and skill, and has honestly carried out his work to the best of his judgment and ability; but the meaning of this is evidently that if, in designing a building, an architect does that which any prudent and skilful person exercising care and skill would have done, and it fails, the architect is not liable for such failure. Of course, it must always be a matter of evidence as to what constitutes negligence or ignorance, and unless the work has been carefully designed, and the specification thoughtfully prepared, errors will arise, and unpleasant litigation ensue. Too much care cannot, therefore, be exercised in the preparation of the design, and in seeing that it fully carries out the requirements of the employer, and great pains should be taken to discuss fully all details of the plans and specifications, and to very carefully explain every contingency that can be foreseen in connection with them. Before the contract drawings are prepared, and tenders obtained, it should always be made a point to obtain, if possible, an acknowledgment that the sketch plans — *i. e.*, those plans which form the data from which the contract drawings are prepared — are approved by the employer; and these sketch-plans should not be destroyed. It might also be added, in passing, that this is a good opportunity for having a definite understanding, in writing if possible, not only of the remuneration to be paid to the architect but upon such other matters as the ownership of plans, and travelling and incidental expenses; for, although the usual five per cent commission is recognized by custom as the proper remuneration, plus travelling and incidental expenses, this is by no means the invariable practice, and many naturally view with suspicion payment based on the cost of the structure. As to the ownership of drawings, in the absence of any agreement to the contrary, the building-owner could claim them.

Another point which cannot be too strongly dwelt upon is the desirability of entering in as minute and full a manner as possible all verbal instructions received from the client relative to the proposed work, and to make such entries as soon as possible after the conversation. Having thoroughly assured himself that the wishes of his client have been embodied in the designs, and that they are prepared in a skilful and reliable manner, the specification must next be drawn, taking care that the interest of the employer is safeguarded in every way, and that the contractor is made responsible for all errors of omission and commission whereby the building-owner suffers damage, even if after the granting of the final certificate. Too much care and caution cannot be exercised in the preparation of the specifications and general conditions, as they are the basis of the agreement, and in the event of any dispute arising either between the building-owner and builder, or between the building-owner and architect, as to the method of carring out the works, they are relied upon and interpreted very strictly by the Courts. Before inviting tenders for the works it is a good plan to have detail drawings to a sufficiently large scale to illustrate any ornamental portions of the design. It saves any question between the architect and builder as to the amount of work intended by the contract drawings, which, being generally prepared to a small scale, renders it impossible to say, with any degree of certainty, what is really intended, although it should be borne in mind that if details are given which show more work than can reasonably be presumed to be intended by the contract drawings, and the contractor execute these works without demur, the contractor cannot afterwards sustain a claim for extras on the ground that the detail drawings constitute an order for the work.

Assuming now that the plans and specifications are prepared, tenders invited, and one accepted, and the contract signed both by the building-owner and the builder, and that such contract contains the usual clauses as to the architect's certificate being a condition precedent to the builder's right of action against the building-owner, and also provides for the decision of the architect in cases of dispute, or difference of opinion either during the progress of the work or in the settlement of the accounts, the work is commenced, and we arrive at the consideration of the second division of the subject, viz, "The duty and responsibility of the architect in the supervision of the work." Before, however, dealing with this head, it may be added that the condition as to the decision of the architect being final and binding in case of dispute in the making up of the final accounts is by no means always inserted in the contract. It is now more usual to have a clause appointing an arbitrator (other than the architect or the building-owner) in the event of any dispute arising under the contract, and certainly, from the builder's point-of-view, this would seem the most satisfactory course to pursue. But so far as the superintendence of the work is concerned, the position of the architect is not materially affected by this clause. It should be distinctly understood that the position of the architect is materially altered directly a contract is entered into between the building-owner and contractor, for the purpose of carrying out the architect's design. Before any contract is entered into, the architect's position is simply that of professional adviser to his client; but after the contract is signed his position is something more than this, for not only has he his duties to perform to the building-owner, but he has to exercise his judgment and discretion in construing the specification as between the building-owner and builder. Not only has the architect to see that the building-owner receives justice at the hands of the builder but he must see that the builder is not hampered by an exacting and unscrupulous client; above all things, the architect must act in a thoroughly impartial and unbiased manner; and let him always bear in mind that, without express authority to the contrary, his duty is to see that the contract is carried out without substantial deviation.

It is often found, however, in practice, that the building-owner cannot realize the position in which the architect is placed as between the parties to the contract, and he will often act — or try to, through his architect — in the most exacting manner, and would construe clauses in the specification in such a manner as would render it quite impossible for the builder to carry out the work. A difference of opinion often arises between the building-owner and his architect as to what constitutes superintendence of the works: there are no definite rules laid down upon this point, and indeed it would be quite impossible to say how much superintendence is to be given to any work to bring it to a successful issue, so many matters having to be taken into account in each case. Oftentimes the building-owner appears to look upon his architect very much as a clerk-of-works, and expects such a large amount of supervision to be given as would render it impossible for an architect to have more than one contract in hand at a time; but this view of the matter cannot, of

[1] By W. J. Jennings, F. S. I., M. S. A.; a paper read before the Society of Architects on Tuesday, January 10, 1893.

course, be upheld. The actual amount of supervision must of necessity depend upon the architect employed. If he is an exceptionally busy man it is impossible that he can give much time to the superintendence, and a clerk-of-works is indispensable. As a matter of fact, no question of "amount of supervision" can be entertained; but it should be clearly observed that as the architect is responsible for the work generally, he should give such amount of time to it as will enable him to see whether or not the works are being carried out substantially as specified, and in particular he should make a point of seeing every part of the foundations before any concrete is put in, and all drains before allowing them to be covered in. Architects take upon themselves a great responsibility when they do not —as is too often the case—insist upon a clerk-of-works. Certainly it ought to be made quite plain to the building-owner that in many matters of detail, in themselves most important, there is a great risk of having the building inferior to that specified unless there is constant supervision, such as only a clerk-of-works can give. If this were always put clearly before the employer, the Courts would attach more responsibility to the building-owner, and less to the architect for defective work, owing to the lack of minute supervision.

The employment of a clerk of works does not, however, relieve the architect of his responsibility, as the clerk-of-works is simply the agent, so to speak, of the architect, who has the sole control, and is responsible for seeing that the works are carried out substantially as specified. In the event of a building-owner bringing an action against the architect, and alleging want of supervision, whereby the building-owner has suffered damage, it would not be sufficient to show that so many inspections had been made during the progress of the works, for it is clear that the actual number of visits an architect pays to the work is no guaranty—in many cases at least—that there has been proper supervision. Of course, if other things are equal, the more frequently works in progress are inspected by the architect the greater will be the chance of their being well carried out; but there are many architects of great experience who would see more in one visit than others of less experience would in a dozen, and no one could plead with success that because he had made so many inspections during the progress of the works therefore he had not been negligent; so, then, it may be said that it is not so much the "amount of supervision" that is the essential as the "quality." So in the case of Rogers *vs.* James it came out in evidence that the architect had visited the works daily during the time the foundations were being put in; but this did not prevent his being held liable to the building-owner for the damage caused by the omission of concrete foundations in places, and for other defects. During the construction of the works the architect will often discover that something has been carried out or omitted contrary to the specification.

In these days of keen competition on the part of the builders to obtain work, and owing to the very general desire of the building-owner to obtain his work at the very lowest cost, irrespective of the character of the builder, the latter often resorts to the substitution of inferior materials and workmanship, to make up for a very low price. Such questions then arise as, for example, the quality of the timber. Very possibly the architect has specified that none but balk timber is to be used, but the builder will try and substitute deals and battens, and so save the difference in price. It is quite possible that the architect may not have discovered this substitution until a great deal of the timber is built-in, and the question arises as to what is the duty of the architect under these circumstances. It may be that the timber is the very best of its sort, and even it may be a matter of opinion which is the better of the two. The architect may be inclined to think that, as the taking of the timber out of the building and putting in that which is specified would be a very serious loss to the builder, and as there is not much difference between the two sorts after all, the case would be met by deducting from the contract price the amount of difference between the two sorts. In that case, one might assume that the employer had suffered no damage; but this is hardly the correct way to deal with such a case, neither is the mere difference in the price of the timber the proper measure of the damage. In a case of this sort,—and this view has been upheld in several cases,—the duty of the architect is clearly to insist upon the material as specified being used, no matter at what expense to the contractor. This brings us to another point, and that is the authority of the architect to order deviations from the drawings and specifications.

Speaking generally, and in the absence of any express condition to the contrary, the architect's relation to the building-owner in connection with the superintending of works would come under that class known as general agents, and he would have power to bind his clients to alterations which he may order the builder to carry out in the details of the work; but there must be no radical alterations in the plans, as the architect's duty is to carry out the plans and specifications which form the basis of the contract, and therefore he must be careful before ordering extensive alterations and variations. Of course, where an architect is employed simply to prepare plans, he is on a very different footing, and scarcely comes under the head of an agent at all. In this case he has simply to supply something for which he receives a certain sum of money, and the matter ceases; but generally architects are not only employed to design a structure, but to superintend its erection, and then the architect may be considered in the light of a general agent, for all purposes for which he is employed, to the building-owner.

The case of Kimberly *vs.* Dick clearly shows that this is the position of the architect. The circumstances of this case were peculiar, inasmuch as there was a distinct understanding between the architect (White) and the building-owner (Dick) that the total cost, including all incidental expenses and architect's commission, was not to exceed £15,000. It was one of the conditions as between the building-owner and the builder (Kimberly) that all questions between the parties under the contract should be settled by the award of the architect. The plaintiff was unaware at the time he signed the contract—or for some time after—that there was any undertaking given by the architect to the employer that the house should be erected for the sum of £15,000, and the contractor claimed to be entitled to be paid by the employer for all quantities executed by him beyond those included in his estimate, and for extra work, and it was held by Lord Romilly, Master of the Rolls, that the architect was the agent of the employer; that his undertaking having been concealed from the builder, the arbitration clause in the contract could not be enforced, and that the plaintiff was entitled to an account for what was due to him for any works executed by him, under the architect's direction, not included in the contract, and for any works so executed under the contract the price for which was not therein included, and for any variations made under the architect's direction, of work included in the contract. This case has been upheld repeatedly, but of course it does not prevent the building-owner from recovering damages from the architect for exceeding his authority. During the course of the building it often happens that circumstances which could not be foreseen cause some alteration from the drawings and specifications, such, for instance, as extra concrete in foundations, and as this is a matter that could not be foreseen, the architect would not be exceeding his authority in ordering it, although it might amount, as it too often does, to a very considerable sum of money.

Speaking generally, if it could be shown that what is done is absolutely necessary for the stability of the building, and that without it the works would be defective, then the architect would be held not to have exceeded his authority; but this must not be taken to refer to works ordered by the architect to cover faults in the design which, by the exercise of skill and care, would have been avoided. In all cases, however, by simply advising the building-owner what is proposed to be done, a great deal of responsibility would be taken from the architect's shoulders; and this course should invariably be taken in dealing with building-committees and public bodies, and all alterations suggested by committees should be embodied in a resolution and entered in the minutes of the committee, and ordered in writing by the architect. While upon the question of authority, we may say a few words as to the authority of the architect to order quantities to be prepared. It is a difficult question to discuss, owing to the want of any definite decision, but the general ruling would appear to be that where the building-owner employs an architect to prepare plans and specifications, and obtain tenders for the work to be done, this constitutes an order for the architect to retain a quantity-surveyor, and take out the quantities; but as there is so much doubt on the matter, the only satisfactory method of proceeding is to let the building-owner know that this must be done and be paid for by him.

Thirdly, the granting of certificates. Under a contract for building, power is reserved to the architect to grant certificates during the progress of the building, and for giving the final certificates, the latter class taking into account all variations made during the progress of the building, and after adjusting all additions and deductions certifying for the balance. Certificates given during the progress of the works are usually provisional, and are subject to adjustment in the final certificate, but an architect having once given his final certificate it cannot be varied, and his duty is at an end under the contract.

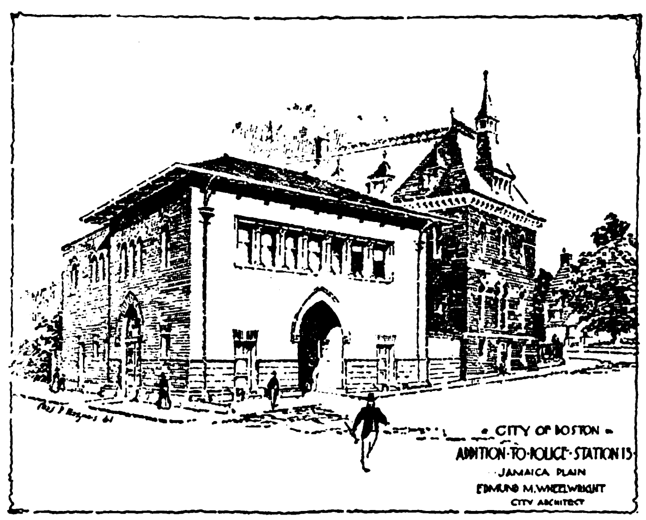
There is considerable doubt on the question of the architect's responsibility in granting final certificates, owing to the recent decision in the case of Rogers *vs.* James. Previous to this decision, many people had been of opinion that an architect when acting under a contract—wherein his decision was to be final and binding as between the building-owner and builder in deciding any question as to workmanship or price—was in the position of a quasi-arbitrator, and in that position could not be held liable to either the building-owner or builder so long as he acted honestly and to the best of his judgment and ability (see the case of Stevenson *vs.* Watson, which decision was founded on that of Pappa *vs.* Rose). This was a case in which the plaintiff contracted with a company to build a hall, the plans, bills of quantities, etc., for which had been prepared by the defendant, who was employed by the company, and named in the contract as their architect to carry out the works. The contract provided that the architect might order additions to or deductions from it, and that the amount of them should be ascertained by the architect in the same manner as the quantities had been measured, and at the same rate as they had been priced; that the contractor and the company would be bound to leave all questions or matters of dispute which might arise during the progress of the works, or in the settlement of the account, to the architect, whose decision should be final, and binding on all parties, and that the contractor would be paid on the certificate of the architect.

The claim then alleged that the contract was signed by the plaintiff in the belief and expectation, as the defendant well knew, that the defendant would use due care and skill in ascertaining the amounts to be paid by the company to the plaintiff; that the work was done, that additions and deductions were ordered, and certificates given by the defendant, but that he did not use due care and skill in ascertaining the amounts, and neglected and refused to ascertain them in the same manner as the "quantities" had been measured, and at the same rate, and knowingly or negligently certified for a much less sum than was the net balance payable to the plaintiff, and refused to reconsider his final certificate, by reason whereof the plaintiff was unable to obtain payment from the company of the balance. On demurrer, it was held that the functions of the architect in ascertaining the amount due to the plaintiff were not merely ministerial, but such as required the exercise of professional judgment, opinion and skill, and that he therefore occupied the position of an arbitrator, against whom, no fraud or collusion being alleged, the action would not lie. The Lord Chief Justice was emphatic in pointing out that the architect is in the position of a quasi-arbitrator, and Mr. Justice Denman in his judgment supported that of the Lord Chief Justice. By this judgment the architect seemed placed in a very strong position indeed. Certainly this was an action brought, not by the building-owner against the architect, but by the builder against the architect; but it seems that if the builder was bound so rigidly to the decision of the architect, — fraud and *mala fides* not being suggested, — how much more so was the building-owner, who has the appointing of the architect, and whom the architect is naturally anxious to please. Certainly, under this decision, the architect was to a great extent made his own judge, in the event of the building-owner bringing an action against him; and yet, if he is liable to an action by one party, after having honestly exercised his judgment and ability in deciding matters in dispute, how is he to give an unbiased decision? In the case of Rogers *vs.* James, however, the architect is under a very different position from that previously ruled, — a decision which places him very much in the hands of an unscrupulous client, as a perusal of the case will show. The extract is taken from the professional notes of the Surveyors' Institution, Vol. V., Part 2: "In a building contract the architect's certificate is final as between the builder and building-owner, but not as between the latter and the architect himself." Action by an architect to recover £123, the balance of his account for services rendered to the defendant, in connection with the erection, by a builder, of a house at Bromley, Kent. The defendant counter-claimed for damages for negligence, owing to the plaintiff not properly supervising the building of the house, in consequence whereof the builder omitted to put certain concrete into the foundations, and omitted to do certain other works. The plaintiff denied he was negligent, and further stated, that in giving his final certificate to the builder he deducted £82 in respect of the omissions from the amount certified to be due to the builder, and contended that this certificate was binding upon the defendant under Clause 16 of the contract between the defendant and the builder. Clause 16 provided that: "The decision of the architect with respect to the amount, state and condition of the works actually executed, and also in respect of any and every question that may arise concerning the construction of the present contract, or the plans and specifications, or the execution of the works hereby contracted for, or in any wise relating thereto, shall be final and without appeal." The action was tried before Mr. Justice Mathew and a special jury, at Maidstone, where the jury found that the plaintiff had been guilty of negligence, and found a verdict for the plaintiff on the claim for £58, and for the defendant on the counter-claim for £90. The learned judge gave judgment accordingly. The plaintiff moved for judgment on the counter-claim, or for a new trial. The Court dismissed the motion. The Master of the Rolls said that the jury having found negligence in the plaintiff, the only material question arose upon the counter-claim. It was contended that the certificate which the architect gave under Clause 16 of the contract was a final settlement of the amount of damages, and could not be questioned by the defendant. It was said that the certificate was final as between the building-owner and builder; any question as between the building-owner and the architect would not be decided by that certificate.

As between the building-owner and the builder, the architect had, in the honest exercise of his judgment, awarded a sum which the building-owner could not question. As against the architect, the building-owner could question that. The jury had found that the architect was negligent, and that the architect had not awarded sufficient. The learned judge was satisfied with the verdict, and a new trial could not be granted. Whether the Court would have arrived at the verdict was not now the question. Lord Justice Lopes concurred. The architect must not act negligently. Clause 16 of the contract gave the architect no jurisdiction to decide any question of negligence as between himself and the building-owner, and the building-owner could bring an action of negligence against the architect. The jury found that the £82 allowed by the architect was not sufficient, and they awarded the building-owner a further sum from the architect. The judge was satisfied by the verdict, and that Court could not disturb it. Lord Justice Kay concurred.

By this decision, it will be seen that while the architect's certificate is final and binding as between the parties to the contract in the absence of fraud or collusion, or any circumstances calculated to bias the opinion of the architect, and that while the building-owner cannot be held liable for more than the award certified by the architect, yet after the architect has honestly done what he considers to be his duty to both parties he is still liable to an action for negligence by the building-owner. Under these circumstances, it would seem that it would be more satisfactory to all parties if, in the event of any dispute between the building-owner and builder, the matter was left in the hands of an independent person as arbitrator. The certificate of the architect is binding between the employer and builder in the absence of any circumstances which would tend to bias the mind of the architect; but the architect having given an undertaking that the building could be erected for a certain sum, this was held in Kimberly *vs.* Dick to be a matter that would bias the architect in deciding between the building-owner and builder, and therefore his certificate was not upheld. Of course, too, undue interference on the part of the building-owner might reasonably invalidate an architect's certificate. Architects should be careful in giving certificates to see that they are in the form prescribed by the contract. A mere statement of accounts approved by the architects is not sufficient. Thus in the case of Morgan *vs.* Birnie, it was held that the fact of the architect having sent on the accounts to the employer, with a letter saying that they were correct, was no evidence of the work having been certified by the architect. This will show how essential it is that the spirit and letter of the contract in this, as in other matters appertaining to the building, should be carefully followed. There have now been pointed out some of the pitfalls that an architect will meet with in the exercise of his profession, but if he shows reasonable skill and ability, and acts with tact and judgment, he need be under but little apprehension in dealing with building-owners and builders, difficult though his position is sometimes made.

THE ENGLISH METHOD OF OBTAINING TENDERS.



I HAVE noticed, during my residence in this country, that there is no systematic method of obtaining estimates of the cost of a proposed new building. The way in which it is done entails waste of time, labor and expense to competitors, and frequently undue pressure.

It has been found necessary in England to establish system and uniformity. It was argued that no employer should desire to obtain from his builder more work or greater value, and that he ought not to obtain less, than is included in the estimate; whilst, on the other hand, he should have every facility to secure due allowance for omitted work; and that it was unreasonable to impose upon a number of builders the trouble and expense of preparing estimates, on the sole chance of one of the number obtaining a contract. Those builders whose standing best qualified them to have an estimate prepared in their own offices either refused to compete, or they employed a surveyor (often not properly qualified, but willing to undertake the work "on speculation") to prepare it. The smaller men who competed prepared their own estimates, and, more often than not, made mistakes therein, for which, if successful in obtaining the contract, they endeavored to recoup themselves during its execution by the substitution of inferior workmanship and materials for those required by the specification, the employer thus losing the advantages which a properly prepared "bill of quantities" would have given him, and having to pay for an inferior article.

To obviate this, and to secure the advantages above described, an intermediary between the architect (who is considered the agent of the building-owner or employer) and the builder, called "a quantity-surveyor," is employed. His duty is to prepare "bills of quantities," *i. e.*, particulars intended to express in exact form the intentions and requirements of the architect as embodied in his general drawings and specification, which may be dealt with as a recognized exposition of the mutual responsibilities of employer and builder.

An expert "quantity-surveyor" is the result of long training and

diligent attention. He must be exact and methodical, have a thorough knowledge of construction and mensuration, be acquainted with the architectural styles, their characteristic differences, and the technical names of their parts. He must be able to write a specification from the architect's notes, to value the work as it progresses, if required, to enable the architect to grant certificates, and to measure and value additions or omissions. He also acts as technical adviser upon matters of construction and detail.

His work in preparing particulars for an estimate, to describe it technically, consists of five operations, viz,:

1. Taking-off; *i. e.* measuring the drawings and noting the dimensions, with their description obtained from the specification, upon dimension sheets prepared for that purpose.
2. Squaring the dimensions.
3. Abstracting them; *i. e.*, transferring the squaring and descriptions of the dimensions to sheets where they are collected under proper headings.
4. Reducing the abstract sheets; *i. e.* casting up the columns of figures under each heading, and reducing the amounts to the denominations in use in each trade, such as rods, yards, squares, etc.
5. Billing; *i. e.* transferring the results obtained by the last operation, in proper order, to bills where they can be priced and moneyed out.

Each operation is carefully checked; *i. e.*, one man squares the dimensions, another checks the squaring; and so with the abstracting, reducing, and billing. This obviates, as far as possible, liability to mistakes.

When the bills are checked they are copied by lithography, and a copy, with a "form of tender" in an envelope addressed to the architect and indorsed with the name of the work and the time and place for delivery of the tender, is sent to each competing builder and to the architect.

At the time named on the envelopes all the competitors, or their representatives, meet at the place appointed, usually the architect's office, each handing in his tender in a sealed envelope. These are opened by the architect or surveyor (who frequently attends for the purpose) in presence of the assembled builders, and the amount of each read out, each builder making a note of the amounts. The successful competitor is required to deposit a copy of his bill with the architect, after it has been compared with the original by the surveyor. This is sealed up and retained to be used in pricing variations, etc., should there be any, at the completion of the contract.

The surveyor's charge is a percentage on the net estimate of the successful builder, plus the cost of lithography and of any special services rendered, which is added to the estimate, the gross amount forming the completed tender. He receives this from the builder when the latter gets his first payment on account, the amount being included by the architect in his first certificate. The charge is usually two per cent, but it varies with circumstances, and is sometimes made a matter of arrangement between the architect and the surveyor.

This system is recognized by the government, has been perfected from time to time by committees specially appointed by the Royal Institute of British Architects, and is in universal use in England. I would suggest the adoption of some such system in this country, adapting it to local requirements, upwards of twenty-five years' experience of its working in England convincing me of its soundness. Its details could be determined by conferences between committees of the societies of architects and of the master-builders' associations in each State or city, or as otherwise thought best. SURVEYOR.

AN ENGLISH HUMORIST ON AMERICAN ARCHITECTURE.

Miserere in Choir of Amiens Cathedral. From *L'Art pour Tous.*

THE great American joke is now one of the best-established common-places of American journalism. If constant repetition will do it, we are likely to be persuaded that, in literature, art, science, and everything worth doing, the Britisher is an ass, and the American is his master; and so we turn with some expectancy to the *Architectural Record*, Vol. I, No. 4, published in New York City. It is bound in terra-cotta paper, and its price is twenty-five cents. It contains reprints of a paper by the late Mr. Freeman, and of one of Professor Aitchison's Academy Lectures,—one of the most amorphous of the professor's learned lubrications,—and the rest of the letter-press is not remarkable, except for the pleasant impudence which sits on the front of American journalists. But the illustrations are, indeed, quite fearful and wonderful; entirely original, purely American. Here you will find the Tower of Babel,—we beg its pardon, the Lancashire Insurance Company's office in New York,—a building of rectangular plan, of which the side is about seven times the width of the front, and the whole carried up to ten stories, though the adjacent house is three stories high, and the pediment of the Doric temple at the side barely reaches the sills of the fifth story. Then there is that amazing building, the Auditorium of Chicago, huge, enormous, spurning all rule and rhythm, where the great staircase is of iron girders fortified with slabs of marble running up the rake of the stairs. "*Illi robur et æs triplex*" who ascends the steps of that fearsome masterpiece, though, indeed, we should be inclined to award the palm of American architecture to the cast-iron corkscrew stairs of the New York Life Insurance Company, for all the world like two shavings balanced on their tails, impending sinister over a sheer abyss of pavement. Nor should we forget the approved lighthouse manner, that now familiar congeries of round towers, conical roofs and battered basement, dear to the man of Massachusetts and Boston, U. S. A.

Then there is the iron construction, in which the Americans are so adept that they will build you a bridge, or a building, in which the failure of a single bolt will bring the whole thing down like a pack of cards. It appears that in New York City a fashion used to prevail of building entire house fronts in cast-iron, with Renaissance, Moorish, or any other approved detail, all complete in cast-iron. We are used to cast-iron mantel-pieces in England, but there is something Titanic in this idea of a house front in cast-iron which cannot but enthral the imagination. The American architect is a versatile person. We are told by the *Architectural Record* that he must be a civil engineer, "he must outrank the mechanical engineer in his knowledge of electricity, hydrostatics," and a great many other things, and, withal, "be an accomplished financier." This shows the inferiority of the Englishman, who foolishly supposes that the business of a financier is finance, and the business of an architect architecture.

We had almost forgotten the lady architect who has designed the women's buildings for the Chicago Exhibition, and of whom gallantry forbid that we should speak anything but praise. If there are lady architects, there must also be lady architect pupils. The very thought of their presence and premiums must make the English architect grin with envy.

Then, too, there are the details. O the details! Byzantine columns are nothing accounted of in this land of wonders. Here will an architect give you a grate the size of a rabbit-hutch, set in an ocean of tiles; and anon a fireplace of massive marble large enough to roast an ox, with a frieze above it fit for a doll's house; and ingle-nooks with arches of machine-made bricks set in stamped leather and panelling—pleasing suggestion of the raw savage in the midst of culture; and chimneys of stone, with hoods of wooden planks. Odd that we English, who have studied fireplaces for some five hundred years, should never have thought of wooden planks for a chimney-hood.

There is much else in this publication to make one pause and meditate. This, then, is the revelation in architecture which America is to give our feeble civilization. We fear our civilization is too feeble to receive it, and, in fact, to be quite candid in the matter, we confess to the feeling that all that is good in it we have seen before, and all that is bad we hope never to see again. The balusters in the hall-way, by Messrs. Chamberlin and Whiddin, we fancy we have already admired in a design by Mr. Shaw. As for the ineffable proportions and exuberant details of American Romanesque, if they are inspired by similar work in England, they have assuredly gone one better in their absence of all scholarship and their ignorance of all restraint. On the whole, and with all respect to the great American nation, we venture to think that she is still young to instruct the Old World in architecture. There are in America a few plain Georgian buildings, of no particular magnificence, out of which her architects might develop a quiet reasonable style; but as for these tons of iron, these mountains of iniquity, these Galatin Banks, these seventeen-story buildings, we will have none of them. The American architects have indeed licked creation, but it is in erecting the most enormously hideous buildings that ever yet burdened the face of the earth.—*The Saturday Review.*

SOCIETIES

THE ARCHITECTURAL LEAGUE OF NEW YORK.

THE regular monthly meeting and dinner of the Architectural League was held in their club-room, 215 West 57th Street, on Wednesday evening, February 1st. There were forty-four members present and six guests, President Russell Sturgis presiding.

Mr. J. Wells Champney, the speaker of the evening, handled his subject, "Pastels and Pastelists," in a most charming manner, and illustrated his remarks with many beautiful reproductions and photographs of famous pastelists and their work.

An interesting discussion followed Mr. Champney's paper, participated in by Messrs. Sturgis, Coffin, Dellenbaugh, Heins, Willard, Hardenberg, Berg, Rich and Briggs.

The League, as a body, by a unanimous vote, heartily approved

and supported bill No. 9592, now before the Senate of the United States, which authorizes the Secretary of the Treasury to obtain plans and specifications for public buildings to be erected under the supervision of the Treasury department, and provides for local supervision of the construction of the same. WARREN R. BRIGGS,
Treasurer and Acting Secretary.

THE WORCESTER CHAPTER OF THE AMERICAN INSTITUTE OF ARCHITECTS.

THE regular monthly meeting of the Worcester Chapter of the American Institute of Architects was held at the Parker House last week. The following officers were elected for the ensuing year:
President, Elbridge Boyden; *Vice-President*, Stephen C. Earle; *Treasurer*, J. B. Woodworth; *Secretary*, C. H. Lincoln.
The secretary was instructed to write the different architects of the surrounding towns who are not already members of the institute with a view of having them join the Worcester Chapter. Other local business was transacted.

THE ILLUSTRATIONS

[*Contributors are requested to send with their drawings full and adequate descriptions of the buildings, including a statement of cost.*]

HOUSE OF HENRY D. WELSH, ESQ., WISSAHICKON HEIGHTS, PHILADELPHIA, PA. MESSRS. G. W. & W. D. HEWITT, ARCHITECTS, PHILADELPHIA, PA.

[Gelatine Print issued with the International and Imperial Editions only.]

INDUSTRIAL TRUST COMPANY'S BUILDING, PROVIDENCE, R. I. MESSRS. STONE, CARPENTER & WILLSON, ARCHITECTS, PROVIDENCE, R. I.

DESIGN FOR A COLLEGE FRATERNITY CHAPTER-HOUSE. MESSRS. NOLAN, NOLAN & STERN, ARCHITECTS, ROCHESTER, N. Y.

HOUSE AT CYNWYD, PA. MRS. MINERVA PARKER NICHOLS, ARCHITECT, PHILADELPHIA, PA.

THIS house is being built of local stone first floor with walls above finished in stucco.
The thing most desired on the second floor was four communicating rooms, to accommodate a family consisting of small children, and if a look is taken at the location of the beds and the doors you will see what a small amount of space is travelled from the mother's room, in the centre, to each child.

HOUSE OF J. B. STETSON, ESQ., OGONTZ, PA. MR. GEORGE T. PEARSON, ARCHITECT, PHILADELPHIA, PA.

GREAT HALL IN THE SAME.

[Additional Illustrations in the International Edition.]

HOUSE OF E. H. VALENTINE, ESQ., CORNER GOETHE AND NORTH STATE STREETS, CHICAGO, ILL. MESSRS. BURNHAM & ROOT, ARCHITECTS, CHICAGO, ILL.

[Helio-chrome.]

IT may lend interest to this subject to know that this was the last dwelling-house designed by Mr. Root.

CENTRAL PORCH AND ROTUNDA OF THE FISHERIES BUILDING, WORLD'S COLUMBIAN EXHIBITION, CHICAGO, ILL. MR. HENRY IVES COBB, ARCHITECT, CHICAGO, ILL.

[Gelatine Print.]

DETAIL OF THE SAME.

[Gelatine Print.]

THE STAIRCASE OF FRANCIS I, CHÂTEAU DE BLOIS, FRANCE.

THE castle of Blois is mainly the work of Louis XII, Francis I and Gaston, of Orleans. The part erected by Francis I is generally most admired, and among all the staircases not one has been so often drawn as that which we illustrate this week, and which is the central point of one façade. In a country where so much of life is spent out of doors it was an advantage to have free access to the balconies, and Blois is not the only case where the approaches are open. The raking lines, instead of horizontal, were inherited from Gothic rather than from Classic times. The figures under canopies are the work of Jean Goujon. He may also have carved some of the salamanders of Francis I, a device that is found throughout the parts which the king had erected. It has not yet been discovered who is the author of this admirable work. Among the scenes of which Blois was the theatre was the murder of the Duke of Guise. The Vieux Cabinet, where the tragedy took place, was approached by this staircase.

DETAIL OF THE SAME.

TATE CENTRAL LIBRARY, BRIXTON, ENG.

THE new library recently erected at Brixton, and illustrated in this number, is from the architect's drawing, which was exhibited in the last Academy exhibition. The building (with site) was presented to Lambeth by Mr. Henry Tate, and was carried out from the design and under the superintendence of Mr. Sidney R. J. Smith, F. R. I. B. A. (the architect of the new picture-gallery which is being built at Millbank). The cost of the library and site was £15,000. The red bricks are from Elham Valley, the stone in the facings is Portland and Beer, the fittings, news-stands, tables, counters, etc., are all carried out in polished walnut. The dimensions of the main rooms are as follows: Magazine-room, 35 feet by 27 feet; newspaper-room, 45 feet by 35 feet; lending library, 46 feet by 37 feet; reference-library, 85 feet by 28 feet; and book-store, 46 feet by 38 feet. In the basement are book-stores, binding-rooms, strong-rooms, etc., and at the side is the librarian's house.

NOTES AND CLIPPINGS

NEGLECT OF MONUMENTS IN PARIS. — Effigies of great men do not always command that respect and attention in Paris which true hero-worship enjoins. Any one will be convinced of this who chooses to take a walk or a drive around the principal metropolitan sites whereon statues are placed. The monument of Marshal Ney, for instance, has now been removed from the former historic spot, near where the famous soldier fell after his execution, to the neighborhood of the Bal-Bullier in the Latin Quarter. The change has been for the worst, as Ney is quite close to a common café, and looks as if he were leading a charge on the dancing-rooms opposite. Worse still, however, is the case of the statue erected to the astronomer Arago. The memorial is ready to be unveiled, and has been so for a considerable time, yet for some reason or other the ceremony has been postponed. In these days of fogs and rains the aspect of the statue is lamentable. The figure of the savant is like that of a ghost covered with a canvas winding-sheet tattered and torn. It gives the impression that the astronomer is reminding his successors at the observatory that he is being left mercilessly and ignominiously "out in the cold." Another pitiful object was, until a few days ago, the model of Dalou's group, "The Triumph of the Revolution," erected on the Place de la Nation. A few years since the pseudo memorial was solemnly unveiled by President Carnot himself while awaiting the termination of the real monument. The model, however, began to crack, under the influence of frost, rain, and sun, until it has at length been removed as a positive eyesore. Neglect of this kind is not rare, even where fully-finished memorials are concerned. In many instances monuments to public men are unveiled amid a great outpour of patriotic enthusiasm, and are then forgotten until attention is directed to their disgracefully weather-worn condition. — *London Daily Telegraph.*

HOW LUMINOUS FOUNTAINS WORK. — M. G. Trouvé has built a luminous fountain for Mme. Patti, at her residence at Craig-y-Nos, an account of which appears in No. 11 of the *Comptes rendus*: "The weight of this fountain is about 10,000 kilograms, and the basin measures 6 millimetres [*sic*] in diameter. The illuminating power is represented by four incandescent lamps of 110 volts, each consuming 6 ampères. Thus the total electric energy amounts to 2,640 watts; this gives, at three watts per candle, a light intensity of over 800 candles. The lamps are centred at the focus of four parabolic reflectors grouped under the glass chambers whence the water springs. As in the chamber fountains, the metallic ajutages, which would have cast shadows, are eliminated. The water which falls from the upper to the lower basin is utilized to drive a small bucket wheel, which governs the rotation of two superposed disks, concentric or otherwise, made of colored glasses, which turn in the same or in the opposite sense, with equal or unequal velocities as required, between the reflectors and the glass. This combination of two disks with opposite rotations renders possible a variation in the play of colors of the liquid sheaves, which succeed each other with the unexpectedness of the kaleidoscope. The motive power can be chosen at pleasure. It may be hydraulic, electric, or by clockwork, of forms and dimensions in keeping with the character of the decoration. These fountains need neither expenses of installation nor costs of maintenance, and their price depends solely upon their artistic perfection and their importance. Hitherto the construction of luminous fountains has only been hindered by the impossibility of sufficiently illuminating the jets. To-day the problem is reversed. Since the light can be projected without sensible loss to great heights, the only difficulty will be to give a sufficiently high pressure to the water." — *From London Nature.*

FIRES DUE TO ELECTRIC WIRES. — Fire underwriters are becoming convinced that a large proportion of the fires that occur and reported as of unknown origin are due to defective electric wires. The difficulty does not lie with the electric lights themselves nor with that system of lighting, but with the unskilful manner in which interior wiring is done. If the wires are properly insulated they may be strung anywhere, and will give safe conduct to the electric current, but the moment the insulation is disturbed there is danger. It is customary in

wiring buildings to run the wires in the most convenient places, and hence they are brought in contact with woodwork, with shelf goods, with old papers and waste of all kinds, and the insulation is readily broken by handling, being rubbed against, or other careless manner. The president of a fire-insurance company recently stated that the building in which he is located had been on fire three times within a few months, and in each instance the cause was ascertained to be a defect in the electric-light wires. Opportune discovery probably prevented a serious fire, but had such occurred it would have been classified under the heading "cause unknown." The combined wisdom of fire underwriters and expert electricians should be able to provide a remedy for bad and dangerous wiring of buildings. It may be necessary to insist that all wires shall be placed in some sort of tubing that is a non-conductor, and all contact with woodwork absolutely prohibited. The number of fires from unknown causes is rapidly increasing, and it seems reasonable to charge them to the increasing use of electricity for illuminating purposes — *Spectator.*

THE TRUTH AS TO LABOR IN BELGIUM. — That periods of frugality and of prosperity should alternate in the history of civilized nations is in itself logical, but often forgotten. England has had its era of prosperity for some time past, during which frugality has not been a national characteristic. For long, certain Continental nations of necessity exercised the austere virtue, but recently — that is, within the last twenty-five years or so — have been gradually asserting their claims to greater luxury or comfort. Conspicuous among these is Belgium; a once rich country that became poor, the era of poverty having taught her people to put forth much effort in hope of small return — the beginning of business success. The small effort for much return, the despisal of the world of small things, and the bitter but necessary reaction, complete the economic cycle. To judge by the report of a committee recently appointed by the Belgian Government to inquire into the influence of the M'Kinley tariff upon the home industry of the country, the Belgian workingman is rapidly increasimg in prosperity, whereat his British *confrère* has reason to be glad. Comparing the year 1891 with 1846, there is a fairly universal rise in wages. In the latter year there were few workmen — some special trades excepted — who earned more than 2*fr.* 50*c.* (2*s.*) per diem, the average wages being hardly more than 2*fr.* (1*s.* 7*d.*) a day. At the time of the inquiry there were few who did not earn 4*fr.* (3*s.* 2*d.*) a day, the average rate being close upon 4*fr.* 50*c.* (3*s.* 7*d.*). The committee, however, did not content itself with determining simply the figure of remuneration, but also made a fairly exhaustive inquiry into the spending value of the money — manifestly a necessary part of the investigation in order to arrive at a satisfactory conclusion. It was assumed that 483 kilogrammes (1,065 pounds) of bread was accepted as the standard of a year's consumption, and in 1846 that quantity would have cost 178*fr.* 78*c.* (7*l.* 3*s.*). In 1891 the corresponding figures would have been 164*fr.* 24*c.* (6*l.* 11*s.* 4*d.*) Reducing this to a time standard, a workman would, on an average, have had to labor from eighty-five to ninety-five days in 1846 to obtain a year's supply of bread, whilst in 1891, forty-five days' work would have sufficed for the purpose as a maximum, and forty days would have been the average. Other things, of course, are required besides bread, and a typical case of a miner is quoted as an illustration. The dietary consists of 100 kilogrammes (220.4 pounds) of wheat-bread, 50 kilogrammes (110.2 pounds) of potatoes, 10 kilogrammes (22 pounds) of beef, 30 kilogrammes (66 1 pounds) of milk, 7 kilogrammes (15.4 pounds) of butter, and 2 kilogrammes (4.4 pounds) of coffee. In 1891, with wages at 4*fr.* 37*c.* per diem, about nineteen and a third days' work would have to be put in to produce the money needed to purchase the quantities of provisions enumerated. With the rate of pay current in 1853, which was 2*fr.* 40*c.* (1*s.* 11*d.*), the workman would have to labor 33.67 days. Further consideration shows that if the purchasing power of wages be taken as the standard of 100 in 1853, in 1886 it had risen to 125.12, and in 1891 to 142.56. The salient facts elicited by the inquiry have been set forth in *Réform Sociale* in a series of articles contributed by M. Armand Julin, from which — as recently stated in the *Times* — "the very important conclusion is to be derived that the assertions of the Socialists as to the increasing misery of the working-classes are unfounded. In Belgium certainly 'the evidence is conclusive that the poor are growing richer and not poorer.'" Before the latter assumption could be accepted as actually definite it would be required to know whether the constancy of work has not diminished. Probably there has been, at any rate, no marked falling off in this respect, but as we have not the original report before us, we do not know whether the point received due attention. It should be stated that the returns of wages were verified by the scrutiny of both workmen and employers, and were only accepted when declared correct by both. — *Engineering.*

SOME CURIOUS ORIGINS OF FIRE. — A suggestive list of unusual and curiously-caused fires comes from a German source. It includes a factory fire which was traced to a railway truck, an over-heated axle having thrown a car from the track and set fire to a petroleum tank from which the flames spread to the building. An instance is given in which a bucket of greasy waste was ignited by the friction of a belt which sagged against it. In a harmless case of spontaneous ignition of oily waste, this material, with some wood chips, had been thrown into the fire-box of an idle locomotive, shortly after which the workmen were surprised by the blowing off of steam by the engine. Another fire was due to oily waste in a manner which could not well be foreseen: only heavy mineral oils were used, and a place was provided for the waste, but a cockchafer crawled from the receptacle directly to a gas-jet, when the creature was quickly consumed, and the oily cotton filaments adhering to its body spread the fire. Well-known incendiaries are photographic and other lenses, which act as burning-glasses, and bright tin-plates, which serve as concave mirrors. A plumber's exploit consisted in applying the flame-test to a newly-made joint in a gas-pipe, then covering the pipe without noticing a small blue flame, which was discovered some six weeks afterward, when the leak had become somewhat enlarged. A nail glanced from a carpenter's hammer into the conveyor of raw material in a jute factory, rubbed against the drum and produced a spark, which set fire to the place. A flood burned one factory by causing a pile of iron filings to oxidize so rapidly as to become intensely heated. A stream from the firemen's hose started a second fire in New York while putting out one in a small building, a neighboring shed, containing quicklime, having been penetrated by the water. — *Exchange.*

A SEEMING NON-SEQUITOR. — Rummaging among the contents of old stalls and hunting for rare editions has been for centuries so favorite a pursuit with Frenchmen that the verb *bouquiner* and the noun *bouquineur* had, of necessity, to be added to the language; and it is safe to presume that in no other part of the world does the bibliophile carry his mania to such extremes as he does to-day in France. One famous collector of the last century offered the best proof of this assertion. He had accumulated so many books in his house that it became absolutely crammed full with them. Circumstances demanded his removal to a different part of the city than that in which he was residing, but he was afraid to remove his literary treasures lest the roof and walls of the house might subside in consequence. So, dire necessity kept him bound in his old quarters. At his death, his library, which had been bequeathed to a Jesuit college, was removed by his executors with the utmost caution and care. The front of his late dwelling was firmly shored up with timbers, and then, after an entire day of unremitting labor, the labor of years was wheeled off to its destination by the aid of no less than six large wagons. — *The Collector.*

TRADE SURVEYS

IT is a fact that a great deal depends upon the character and meaning of the incoming president's inaugural address. It is seldom that so much hangs upon the mere utterances of an individual. If the manufacturing public is satisfied with what is said at Washington on March 4th, there will be a larger volume of business done soon after; if not, the same hesitating, hand-to-mouth policy will be pursued as has been for months past. The point in all this anxiety is: Will a spirit of hostility pervade future legislation? In business circles, East and West, there is a feeling that the change in administration is not to be feared in any manner; that, even were there a disposition to run counter to former economic policies, it will be practically impossible to do so; and that the early utterances of those whose privilege and duty it is to speak for the new political powers will be of a character to convince all that no harm or prejudice will be suffered by those industries which rely upon careful handling by the Government. The political action of the incoming administration has been pretty thoroughly discounted, or, at least, anticipated. The second month of the year has developed nothing of importance. Cautious procedure is apparent on all sides. Business men are afraid of big stocks. Manufacturers cannot be prevailed upon to run into large or long contracts for raw material. Storekeepers and traders, big and little, buy in small lots, trust as little as possible, and pay their debts with the greatest possible promptitude. As nearly as can be ascertained, the book-account indebtedness of the country was less at the opening of the year than ever before, considering volume of business done. Bank people say that "paper" is taken up with promptness, and that less than usual is carried over in renewals; that is, the country is learning to be economical, frugal and exact in its dealings. The volume of insolvency is not frightful among the exchangers of values. Frequent settlements are the rule. Jobbers do less urging upon traders to pile up goods; in short, jobbers and retailers now study each other's interests. Store-keeping is becoming more of a profession, and it is studied in its details, to the advantage of both sides. There is much to be said on this subject of a pleasing nature, and the progress made in the art of legitimate and safe dealing is certainly creditable to reason and experience. The ability of buyers to pay is now scanned carefully, and their credit is determined thereby. In this respect competition has declined, and decent traders in all channels have a better chance. The reports from all sections and all interests for the past week indicate a holding back. The volume of business has not increased. Railroad traffic is at a standstill. Freight-rates are maintained. Congressional legislation in pooling interests will probably be denied, though public sentiment, could it be sounded, might be found favorable to a certain carefully-measured liberality in this matter. In the building interests, quite a number of contracts have just been made for brick, which seems to be advancing at certain points, though the authorities consulted give no reason for the stronger prices, except that stocks were exhausted in several markets last fall. Cements have increased in stock. Lath, shingle, slate are also in large stock in primary and secondary hands, the manufacturers having decided to enter upon the spring trade with supplies ample for any probable demand. This means lower prices, should building operations be checked. Lumber stocks will be somewhat larger than a year ago, if lumber authorities can be accepted. A great many new mills have been built, and old ones enlarged, especially in the yellow-pine belt. In iron and steel, large orders were placed last week, and this for rails and ship-building purposes. In agricultural-implement industries, an impulse has been given to trade by a reported scarcity of equipments. The good prices realized on agricultural products, and the prospects for a greater export demand, are having the effect of expanding the agricultural area, or, rather, are strengthening the purpose of the farming interests to plant and sow more land. The distribution of breadstuffs has been all that could be desired by all excepting speculative interests, and in the Gulf States the latest commercial reports are of a satisfactory nature. One feature of our progress deserves especial mention, viz, the extension of short railroads, the building of short steam and trolley lines, and the bringing together of so many people for the more rapid exchange of services. Electrical authorities last week counted up the projected construction of over one hundred lines and systems in as many cities and towns. The electrical engineers themselves say that their facilities are taxed, and that the outlook for work was never better. There are no actual dangers in any quarter. Rumors of labor troubles are rife on certain lines of railway, but the railway managers will surprise the public if they have occasion to show what they can do in meeting strikes. The month of February will probably pass without special incident, but the foundation has been already laid for an enormous business in 1893. Whether it will be done at the present low range of prices is the question merchants and manufacturers, big and little, would like to know.

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CONTENTS

Summary: —
The Movement to create a Memorial to the late Bishop Phillips Brooks. — Civil Service in France and the Declaration of Rights. — The Panama Canal Scandal. — The Development and Modernizing of the City of Sofia. 97
The Languedocian School of Architecture. — I. 99
The Saxon Church at Bradford-on-Avon. 100
Construction. — XX. 102
Letter from Canada. 106
The Main Quadrangle at the World's Fair. 107
Effect of Turpentine Gathering on the Timber of Long-Leaf Pine. 109
Societies. 109
Illustrations: —
The Indiana State-House, Indianapolis, Ind. — Six Competitive Designs submitted for an "Eads Memorial Entrance" to the St. Louis Bridge. — House at St. Louis, Mo. — The First Methodist-Episcopal Church [Sands Street Memorial], Brooklyn, N. Y. — The Union Railroad Station, Portland, Me. — House at Oyster Bay, Long Island, N. Y.
Additional: Door in a Private Dwelling, Rue Ballu, Paris, France.— A Fireplace in the same House.— Seal of La Société des Architectes du Poitou et de la Saintonge, France. — The Château de Pierrefonds: Façade on the Court. — House at Wilpshire, near Blackburn, Eng.— House at Witton, Blackburn, Eng. — Proposed Clock-tower, Walton-on-the-Naze, Eng. 109
Communications: —
The U. S. Timber Examinations and Tests. — The Caisson Foundations of the Manhattan Life Insurance Building. — Modern Sepulture. 110
Notes and Clippings. 112
Trade Surveys. 112

THE friends of the lamented Bishop Brooks, of Massachusetts, among whom may be counted all persons who have ever come within the influence of his pure and loving spirit, wish to perpetuate the remembrance of him by some enduring memorial. A committee of gentlemen interested in Harvard College affairs are urgently in favor of having subscriptions for that purpose applied to establishing a fund for maintaining religious exercises in the University, and think that, if three hundred thousand dollars could be contributed, this apparently expensive luxury might be secured; but, although the friends of Dr. Brooks would, we suppose, acknowledge that the maintenance of religious services in Harvard College is a desirable object, most of them seem to prefer to have their money used for a more tangible memorial, which they would like to see erected in Boston, the birthplace of their beloved bishop, and the scene of most of his labors. In the choice of the character of the memorial, and the site for it, there is, however, great diversity of opinion. Naturally, the neighborhood of Trinity Church, which was Dr. Brooks's charge for many years, seems an appropriate position, and as the church fronts on a spacious assortment of polygons, known collectively as Copley Square, which is, moreover, already architecturally notable, this certainly seems to be the best place for setting whatever statue or monument may be decided upon.

DR. BROOKS, who was greatly attached to Trinity Church, and always regretted the necessity which existed, at the time of its erection, for leaving Richardson's design incomplete, left by will a contribution toward constructing the western gallery, which formed a part of the original plan. When this was announced, it was at once proposed by the newspapers that the money contributed should be devoted to making up the sum required — about seventy thousand dollars — for completing the west façade of the church in accordance with its bishop's wishes. The members of the church, however, much preferring that this mark of affection for their friend should be their own affair, completed the amount themselves, declining any contribution from outside, so that the subscribers to the general fund are free to follow their own judgment. Of course, there have been numberless propositions that the fund, which it was hoped to make one hundred thousand dollars, and is likely to be more, rather than less, should be devoted to hospitals, infant-homes, and so on; but, however admirable these charities may be, it is evident that a large part of the subscribers prefer, and with reason, to see it used for a purely artistic memorial, which shall remind them, not of the excellences of Christian charity, or of virtue in general, but of the man whom they have loved.

WE do not often find any contributions to political science in our technical exchanges, but a story appears in *La Construction Moderne* which we can commend with confidence to civil-service reformers as one of the most interesting of its kind. Last August, in the French Department of Pas-de-Calais, a competitive examination was held, for the position of assistant in the office of the Ponts et Chaussées. Seventeen candidates entered for the examination, six of whom belonged to the town of Saint-Omer. Out of these six candidates, four, of excellent character, graduates with diplomas from the schools, and favorably reported, after the preliminary inquiries, by the engineer-in-chief, were excluded, by order of the Minister of Public Works, from the competitive examination. It happened that all the four had been educated at private schools, which, in France, generally means Church schools, and their exclusion was attributed to this circumstance. The matter caused a good deal of comment, and a member of the Chamber of Deputies made it the subject of an interpellation of the Government, asking whether there had not been a violation of the Declaration of Rights, which decrees that no Frenchman shall be molested on account of his religious opinions.

THE Minister of Public Works, M. Viette, replied to the interpellation very frankly, not to say coolly. He acknowledged that he had refused to allow the four candidates to be admitted to the examination, but said that there were numerous precedents, under all administrations, for such a course, and that his decision was based on an administrative proposition. The prefect of the Department had been called upon to make a very complete investigation in regard to the candidates, and had ascertained that the four excluded ones belonged to "families connected with some of the most noted members of the reactionary party" — "*des familles inféodées aux personnages les plus marquants du parti réactionnaire.*" Under such circumstances, they would not have been admitted, even if they had been graduates of the public schools; and in the same department a graduate of a convent-school had been admitted to the examination in question. In fact, the administration did not concern itself with the fact of a candidate having been educated in this or that establishment, but only with his political relations. He thought that every one would admit that the government should not recruit its functionaries among the adversaries of the institutions which they would be called upon not only to serve, but to commend to public favor. "The fact," he thought, "of occupying a public employment implied fidelity and devotion." The ingenious impudence of this explanation is sharply exposed by M. Rümler in *La Construction Moderne*. In brief, he says, four young people are refused entrance into the public service, not on account of their personal opinions, for, being boys of only seventeen, they could hardly have any, but on account of those of their families; and he thinks, with justice, that such mean discrimination, which M. Viette would probably call clerical intolerance if it were to be applied by his political opponents to his own friends, tends only to revive the political resentments which had shown signs of disappearing in a common attachment to liberal institutions.

THE great Panama scandal has a certain interest for architects, not only on account of its being the most gigantic piece of robbery since the South Sea bubble, but because the tricks through which the stockholders were swindled are almost all very familiar to the older members of the profession. To put the whole story in a few words, the stockholders and bondholders of the company paid in about two hundred and sixty million dollars in cash. Of this, about fifty-four millions were paid back to them, in interest and payments on drawn bonds, leaving two hundred and six millions, with interest, as their net investment. Eighteen million six hundred thousand dollars is said to have been spent in buying the Panama Railroad, which would probably be a good asset,

but is said to have been hypothecated to contractors, who, again, have virtually disposed of it to certain bankers. Of the remaining one hundred and ninety-seven and one-half millions, not quite one hundred and twenty-two millions are said to have been paid for construction, materials, and transportation, or to contractors, while the balance of seventy-six million dollars is charged to "Preparatory work, organization, concession, general expenses, advertisements, taxes, etc." It may be imagined that the concession and the taxes did not form a very large part of this item, and the fact is perfectly obvious that something like seventy million dollars was used in "organizing" and "advertising" a company formed for the purpose of spending a hundred and twenty-two millions in digging a canal. Nor is this by any means all. Of the one hundred and twenty-two millions alleged to have been paid out for the actual canal work, it is very doubtful whether the company received more than a fraction in value of what it paid for. Of the American contractors engaged on the work, the two most important were a New York corporation and a private firm. The corporation, which was formed for the purpose of carrying out this single contract, and never did anything else, was dissolved a few months ago, after paying more than a hundred per cent in dividends to its stockholders; and two members of the private firm are said to have made a profit of three million dollars apiece out of their Panama contract alone. But if such enormous profits were made by quiet American contractors, who had no political or financial influence, and obtained their contracts simply because they were the lowest bidders for their part of the work, what must have been the gains of the French individuals and corporations, who were not the lowest, but the highest bidders, and who are acknowledged to have been employed because they could help in floating the company's bonds? According to the testimony in the French court, M. Eiffel's profit on his contract for a part of the work was six million dollars, and it appeared from his own testimony that he received large sums on account of a contract for certain machinery, although he never furnished the machinery. The American newspapers, at the time, were full of accounts of the dredges purchased and sent out, at immense expense, by the company, which never did any work whatever; and, of those which did work, the *Engineering News* reported that one lay at anchor for many weeks under a sloping bank, shovelling mud up the slope, from which it immediately ran back, to be shovelled over again. Taking these things into consideration, together with the enormous prices specified in some of the contracts,— such as five dollars a cubic yard, for example, in M. Eiffel's contract for embankment, and the vast outlay at Colon for hospitals, offices, residences, and so on, having nothing to do with the actual canal excavation,— it is doubtful whether the real value of the work done on the canal was much more than one-tenth of the sum actually subscribed and paid in by the deluded purchasers of the stock and bonds. The rest, with the exception of that paid for the Panama Railroad, and the comparatively small legitimate expenses of administration, appears to have been swallowed up by favored contractors, by the greedy managers of the most venal press in Europe, and by what Feuillet calls *la haute corruption financière*.

WHILE some may regret the severity few can question the abstract justice of the sentence of from two to five years' imprisonment for the Count de Lesseps, his son Charles, M. Eiffel and two or three others, which has been the outcome of the exciting investigation which has just closed at Paris. The onus of culpability seems to have fallen upon at least some of the shoulders where it should rest. Yet without sharing the respect for the rather tawdry and theatrical glory in which De Lesseps has been arrayed since he accomplished the not really difficult feat of making the Suez Canal, common humanity can accord to the infirm and mentally broken old man some share of sympathy in his misfortunes, while stoutly decrying all the time that he deserves leniency, because his adherents assert for him a right to be held, with Victor Hugo, "one of the glories of France." Interest in the Panama matter is now transferred to this country, where a Committee of the House of Representatives is trying to discover what has been the American interest in the bubble, and it seems likely that a clear understanding of what went on here may be had, since Mr. Seligman, the banker through whose bank forty million dollars were disbursed, appears to be willing to answer frankly all questions asked, and has declared his willingness to produce his books for examination.

WE have before spoken of the energy with which the town of Sofia, the capital of Bulgaria, is being transformed from a village of hovels into a brilliant modern city, and of the peculiar system under which expropriations were made for the rapid and extensive operations necessary for carrying out the plans which have been determined upon. Quite recently, M. Arthur Comte, the chief engineer of the city, has given, in the *Schweizerische Bauzeitung*, a detailed and interesting account of the present state of affairs there. It must be remembered that it is only a few years since Sofia was a residence of one of those Turkish beys who, according to the observations of English travellers, amused himself by impaling on sharpened stakes the Bulgarians who happened to incur his displeasure; and that its connection with the outside world by means of a railroad is a very recent thing. In fact, if we are not mistaken, the citizens were so well contented with their isolation that, if Prince Ferdinand had not paid a large part of the cost of the railroad out of his own pocket, they would probably have been without it to this day. Now, however, matters are changed. The half-savage Bulgarians have had an opportunity of seeing "the wonders of the world abroad," and have drawn from their observations comparisons unfavorable to their ancient ways of life. Moreover, being blessed with a beloved and enlightened prince, and having, at the head of the city, a very energetic mayor, Dimitri Petkoff, they have had an intelligent direction given to their efforts at improvement of their condition, which seems likely to carry them very far in the path of municipal civilization.

NATURALLY, the first thing to be done in a Turkish town was to widen the streets, and this was effectually provided for by laying out a system of splendid boulevards, ninety-two feet wide, one of which, the Boulevard Ferdinand I, entirely encircles the city, while several others traverse it in various directions, dividing the whole town into regular blocks, which are again subdivided by streets varying from thirty-two to eighty feet in width. Besides these, there is, as is common in Continental cities, a splendid avenue leading from the central portion of the city to the railroad station. This avenue is one hundred and ninety-seven feet in width, and comprises a central roadway fifty-nine feet in width, two lateral streets, two gravel-walks, and a paved sidewalk, twelve feet wide, next the houses on each side. Six rows of trees shade this noble avenue. Another street, the Boulevard Stambouloff, which leads from the middle of the town to the new park, passing by the prince's palace, is one hundred and fifty-seven feet wide, divided like the other, and with four rows of trees. To carry out these streets, sixteen hundred and ninety-eight houses were demolished in three years, and eighteen hundred and eighty-six reconstructed. Meanwhile, the area of the city doubled, and although the population, which is at present thirty-seven thousand, is probably smaller than it was during the Turkish occupation, the inhabitants have much more fresh air to breathe than ever before. But what would astonish the old impaling beys most is probably the improvement in the supply of light and water. Hitherto, water has been obtained by bringing supplies from the neighboring river, which is far from being of unsullied purity, through wooden pipes to street hydrants; but springs have now been taken in the mountains, which will furnish very pure water, and dams have been built, and pipes laid, to distribute it in the modern manner. For lighting, a waterfall in the upper course of the River Vitoche, situated about nine miles from Sofia, and sixty-five hundred feet above the sea, has been utilized to drive three turbine wheels, giving a force of two thousand horse-power, which is converted into electric currents by six dynamos, and transmitted to the city, where a part of it will be used for lighting the streets, and the rest, probably, for propelling electric street-cars. Besides these improvements, a beautiful park has been laid out and planted, a large public garden has been formed in the middle of the town, with smaller ones at various points, and a great nursery, covering a hundred acres, has been established near the city, from which plants are not only supplied to the public parks and gardens but are sold by the city to private individuals who wish to decorate their houses or estates.

THE LANGUEDOCIAN SCHOOL OF ARCHITECTURE.[1] — I.

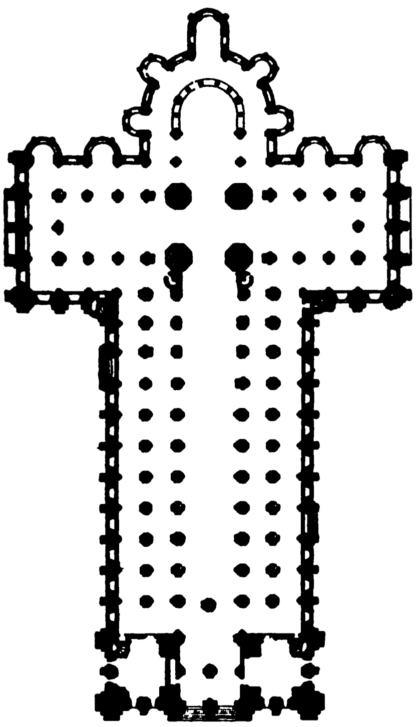


Fig. 1. Church of St. Sernin, at Toulouse.

THIS school is so called because Toulouse, its original home, is situated in Languedoc; but its sway does not extend over the entire province, and, on the other hand, it comprises most of Gascony, a part of Guyenne, Béarn, the County of Foix, Roussillon, and northern Spain from Galicia to Aragon. The limits are clearly defined at only two or three points. On the south the Pyrenees, as we see, form no boundary for it. On the east, it does reach the Mediterranean; but, confronted even at Béziers and Nîmes by powerful Provençal influences, it really touches the Rhône only at Viviers, and for the Gothic period alone. We, however, accord to it the banks of the stream from Viviers to the sea, making certain reservations for the Provençal school and calling attention to the fact that the territory of the latter is, in its turn, invaded by the Languedocian, so far as sculpture is concerned. An ideal line of demarcation drawn from Viviers cuts Vivarais and Gévaudan, leaving only the southern half of each to the Languedocian school; beyond this, it claims Rodez, Conques and Figeac and is deprived of Cahors, Agen, Nérac, Saint-Séver, Dax, Bayonne and perhaps the entire shore of the Bay of Biscay.

During the Gothic period, within this monumental district, the largest in France, a restricted school grew up, which we will term the school of Toulouse because this city inspired it most directly and was very nearly its geographical centre. Its outer bounds were the towns of Castelnaudary, Castres, Albi, Cordes, Saint-Antonin, Caussade, Moissac, Valence-d'Agen, Fleurance, Gimont, Saramon, l'Isle-en-Dodon, Aurignac, Saint-Girons, Foix and Mirepoix.

The Languedocian school not only covers the greatest extent of territory of all the French schools, but it is also reputed to be the oldest. Its sculpture has its roots in antiquity. In those days its two centres were Narbonne, capital of the earliest Roman possessions in the Gauls, and Nîmes; under Augustus and the Antonines the latter city and its environs for a considerable distance around were dotted over with sumptuous monuments of a remarkably fine style. The city of the Tolosates was united to these two toward the end of the second century, and it soon won for itself the intellectual supremacy. In the time of Ausonius it was already entitled "*Palladia Tolosa*," — Toulouse the learned. Though its fortification-walls were built of brick, marble statues and columns were not wanting in the capitol and temples. The rich quarries of the central Pyrenees were then in full operation, for example, at Aubert, Saint-Béat and Sarrancolin — and the products were not all sent to Rome. A goodly portion of the yield was taken up at Martres-Tolosane, and there chiselled and shaped in the most important *atelier* of sculpture ever known in France. Several of the cities of Narbonaise and Aquitaine evidently drew their supplies from this *atelier*, which turned out works of genuine merit, if they can be judged by the valuable specimens now in the museum of Toulouse.

The domination of the Visigoths, whose seat of government was fixed at Toulouse from 419 to 508, arrested for nearly a century the progress of barbarism in this region: in spite of a few short-lived persecutions, the Christians continued to rear beautiful churches in the country lying between the Pyrenees and the Cevennes; there was one at Narbonne with a lantern-tower in the centre. Between 442 and 446, Rusticus, bishop of Narbonne, erected at Minerva, in his diocese, a basilica, the dedicatory inscription of which is preserved and gives us a glimpse of its magnificence. In the early days of Frankish rule there were yet a few generations of skilled architects. Launebode, governor of Toulouse, found at hand a man capable of constructing a basilica for him in this city, "the like of which a Roman artist could not have erected," according to Fortunat. A century later, that is about 640, Géry or Didier, bishop of Cahors and a native of Albi, endowed his episcopal city with monuments of all kinds whose massive walls won the admiration of his contemporaries.

Meanwhile Gallo-Roman civilization had not been wholly banished from what was to be, from the ninth to the thirteenth century, the flourishing county of Toulouse. The municipal institutions were much less altered there than in the provinces of the north, notwithstanding the material ruin effected by the invasions of the Saracens and the Normans. The latter part of the tenth century and all of the eleventh may be considered as a period of architectural restoration. Many of the ancient cities were rebuilt: Lescar (980), Lectoure (990), Maguelonne (about 1045), Oloron (1085) and Comminges (about 1100). Toulouse was as prosperous as ever, and its court, represented at Paris by the haughty Constance, was the most polished in the west. It was during the time of Queen Constance, from about 1010 to 1030, that the main elements of the Romanesque-Languedocian architecture must have become fixed. We ought not to seek any very pronounced stamp of a school in the Carlovingian edifices of the region, — not in the curious choir of Saint-Just at Valcabrère more than in certain fragments preserved in Lower Languedoc, — exception perhaps being made for the sculptures and a few profiles. The construction of the basilica of St. Sernin, the choir and transept of which belong to the second half of the eleventh century, and the nave to the twelfth, marks the first period of artistic glory after the Roman.

St. Sernin (Fig. 1) exhibits all the grandeur and nearly all the characteristics of Languedocian Romanesque art. There are few edifices whose influence has been so great on a school of architecture or has extended so far even outside of the limits of its school. There are likewise few whose influence can be so easily detected. This ascendency is due to its structural beauty and the ampleness of its dimensions; after Cluny it was the most finished and the most remarkable of all the Romanesque churches. Its length is 377 feet and its height, beneath the vaulting, 72 feet; the breadth of the five aisles is 105 feet and the length of the transept 210 feet. The unusual development of the latter, each arm of which is flanked by two small apsidal recesses, the five aisles, the right angles of the inner side-aisle on the arms of the transept as well as on the nave, and the binary disposition of the great doors on the three façades, constitute the typical elements of St. Sernin much more than the

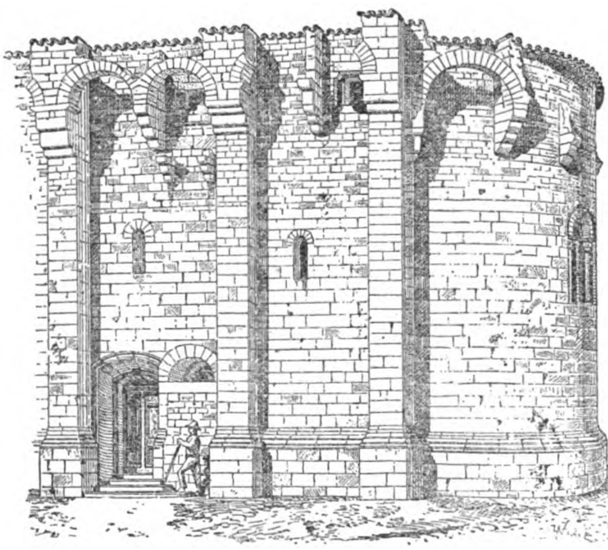


Fig. 2. Church of Celleneuve.

deambulatory and the five radiating chapels. These features, with a few others that we shall indicate, unquestionably exist in the most celebrated of Spanish-Romanesque churches, at Santiago de Compostela (see *American Architect* for June 6,

[1] From the French of Anthyme Saint-Paul, in Planat's *Encyclopédie de l'Architecture et de la Construction.*

1891, "Spanish Architecture," Fig. 9). The church of Conques, in Rouergue, is a diminutive St. Sernin. In many respects, Saint-Salvi at Albi, Saint-Théodard at Montauban, Saint-Sauveur at Figeac and, outside the limits of the Languedocian school, Saint-Martial of Limoges and even Saint-Martin of Tours are, or were, derived from St. Sernin. The inner side-aisle of St. Sernin is covered with groined vaults, as is the outer; but above it runs a gallery covered with half-barrel-vaults, which form an abutment to the bold barrel-vault of the nave; this constructive arrangement is common to the schools of Auvergne and Languedoc. In the latter, besides at St. Sernin and its derivative Sainte-Foy of Conques, examples of it are seen in the churches of Saint-Gaudens, Aulon, Valcabrère, Saint-Bertrand-de-Comminges (bay of the belfry), Marignac and Saint-Béat, in Haute-Garonne; in Notre-Dame-de-l'Oder, at Ambialet, in Tarn; in the churches of Fontfroide and Rieux-Minervois, in Aude; of Espondeilhan, in Hérault; of Elne, in Pyrénées-Orientales; of Unac, in Ariège; in Sainte-Croix at Oloron, in Basses-Pyrénées, and in the church of Bosost, in the valley of Aran, a section which formerly belonged to Comminges.

The twelfth century witnessed the rise and development of the system of broad naves without side-aisles, which became so common during the Gothic period, and the origin of which is variously accounted for. An attempt has been made to connect it either with the plan of certain Provençal churches, for example, the cathedrals of Avignon and Cavaillon, or with the influence of churches with Périgord domes, which asserted itself through the cathedral of Cahors, Saint-Caprais at Agen and the cathedral of Tarbes. Without attempting to settle this question, we will remark that the single nave offered two advantages to the people of the south which caused its general adoption. In a region where brick was the building material, it made it possible to dispense with interior piers, which would of necessity have been too massive to accord with the tendencies of the period; again, this disposition admitted of the construction of walls of uniform thickness carried straight up and crowned with great machicolations connecting the buttresses, a matter of no small importance during the troubled reigns of the last counts of Toulouse. The churches of Celleneuve (Fig. 2) and Vic-Mireval and the cathedral of Agde were built in this way; their machicolations, which very probably antedate those of the donjons of the Château-Gaillard and of Niort — both by Richard Cœur-de-Lion — are certainly among the most ancient in France. The style was in vogue down to the close of the Middle Ages, with the simple substitution of the broken arch for the semicircular.

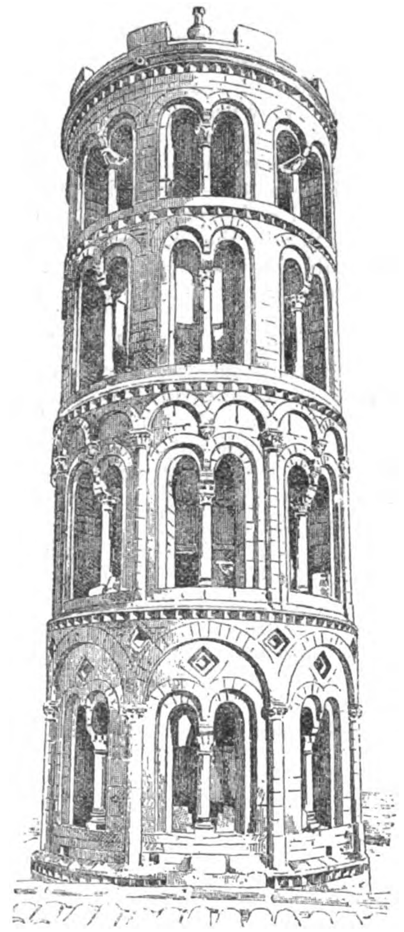
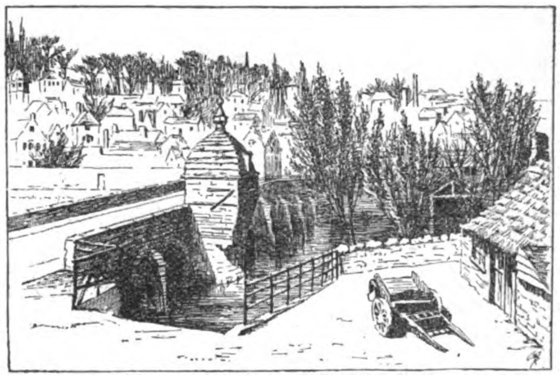


Fig. 3. Fenestral Tower, at Uzès.

The care taken to fortify religious structures against armed attacks, and even to make them serviceable in the defence of the surrounding country or of the monastery, was nowhere more vigorously exercised than in Languedoc, from the middle of the twelfth century until the close of the religious wars of the sixteenth. It was for this reason that the bell-towers of the Romanesque era were of a feudal simplicity that made them quite like keeps, and that enabled them to serve as such in case of need. The staircases and interior passages often present strategical devices; octagonal towers are rare and the stone spire was wholly unknown before the Gothic period. The isolated tower of Saint-Stephen at Puissalicon (Hérault), with its obtuse roof, is an exception; the elegant fenestral tower at Uzès (Fig. 3), on a circular plan, appears to be an imitation of certain Italian campaniles, but it has found no copyists in France.

(To be continued.)

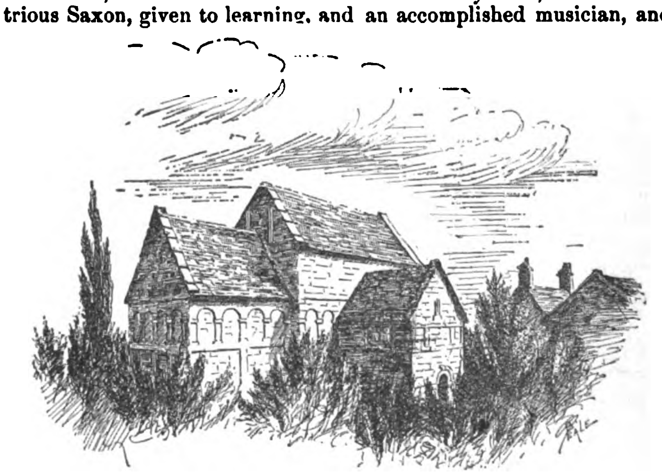
THE SAXON CHURCH AT BRADFORD-ON-AVON.



Bradford Bridge, with Chapel.

NESTLED upon the side of a hill which rises from the water's edge, the old town of Bradford with its gray stone houses forms a picturesque termination to the valley through which river and railway run side by side. From Avonmouth, where it enters the Severn, through Clifton, Bristol and Bath, to Bradford, a prettier little watercourse, embedded in pasture-land on one side and wooded hills upon the other, could scarcely be found. But beauty of scenery is not the object of the modern pilgrim, who alights from the train at Bradford; verdant trees and grassy pastures, wooded hills and limpid streams may be found all over our island; but a little church of ante-Norman times, an authentic Saxon building, is not to be seen everywhere. It is unique, and, in the words of Professor Freeman, "the one surviving Old English Church in the land." "So perfect a specimen," he adds, "of primitive Romanesque is certainly unique in England; we should not be surprised if it is unique of its own kind in Europe."

The origin of the town's name is purely Anglo-Saxon, — Broad Ford on Avon; this being the spot where vehicles forded the river before the bridge was widened; for, originally, only foot-passengers and pack-horses could traverse the bridge. Whether Bradford was a Roman settlement or not is doubtful, but it being situated in a country which was a stronghold of the Romans, and various "finds" having been discovered in its neighborhood, it probably was, although there is no direct evidence. To its north lies Cirencester with its Roman pavements, and only a few miles to the west is Bath, now so rich in extensive ruins of its Roman baths; to the east is Old Sarum, and to the south Silchester. But authentic history begins about A. D. 700, when Ina, King of Werres, granted permission to St. Aldhelm, afterwards bishop of Sherborne, to build a monastery, endowing it with lands and moneys. St. Aldhelm, or *Aldhelmertone*, as the name is written in Doomsday-book, was an illustrious Saxon, given to learning, and an accomplished musician, and,



Chancel, Nave and North Transept, from the Northeast.

like his descendants, having a passion for travel. He visited France and Italy, and for some time worked and studied under Maidulf, the Scotch anchorite who kept a college at Maidulfes-Burg, afterwards Malmsbury. Subsequently he became a Benedictine, built a monastery at Malmsbury, and became its first, or second, abbot. He

seems also to have been abbot of Frome and Bradford, for, upon becoming bishop of Sherborne, he wished that, "his monasteries should receive an abbot selected by the spontaneous voice of my establishment." But his pious monks objected: "As long as you are alive we will most humbly submit to the yoke of your government, entreating only that you will by deed secure to us, that, after your death, no king, or pontiff, or any authority claim dominion over us, except with our voluntary consent." The bishopric to which Aldhelm was appointed in 705 was one of two sees formed out of the old bishopric of the West Saxons. For more than 300 years the see was situated at Sherborne; then it was removed to Wilton, afterwards to Old Sarum, and subsequently to Salisbury.

The monastery founded in Bradford by St. Aldhelm is said, by William of Malmsbury, to have been dedicated to St. Laurence. Its site was most probably near the northeast end of the present church, a spot of ground still bearing the name of the Abbey-yard, and where, a few years ago, several stone coffins were discovered. If this conjecture be a fact, the little Saxon church now standing may be the veritable building founded and consecrated by St. Aldhelm at the commencement of the eighth century, and used in the last century as a schoolhouse. Between these two eras, it must have seen many changes, for we find it described, in 1715, in the deed of conveyance to trustees as "a building adjoining to the church-yard of Bradford, commonly called the Skull House," which seems to imply that it was, at some time in its history, used as a charnel-house. In 1715, the nave and porch were used as a school for the children of the parish, and it was probably at that time that the chancel was converted into a cottage, the chancel arch being made to serve as a chimney; for, when the church was restored, a segment of the arch was discovered in this chimney. When used as a school, the nave and porch formed three separate rooms, one on the ground and two on the first floor; and to the south of the nave there was a two-storied house, built probably about 1715, and used as the schoolmaster's residence.

The following are the exact dimensions of the various parts of the building[1]:

	Breadth.	Length.	Height to wall-plates.
Porch	9 feet 11 inches	10 feet 5 inches	15 feet 0 inches
Nave	25 " 2 "	13 " 2 "	25 " 3 "
Chancel	13 " 2 "	10 " 0 "	18 " 0 "

Doorways: — width, 2 feet 4 inches; height to crown of arch, 8 feet 4 inches.

The building has three distinct roofs. All the elevations, excepting that of the porch, which was only of two, were divided into three stages. The lowest was quite plain, with the exception, only, of a series of slight projections, which are so slight that they can only be called pilasters, and not buttresses. These occur at regular intervals, and support a string-course which runs all round the building. Upon this string-course runs an arcade, consisting of a series of flat pilasters, partially moulded upon the east, and formed by upright stones which do not tail into the wall; and on these are square blocks of stone, slightly bevelled, which *appear* to support plain arches. The arches themselves are only surface decorations, not constructive arches, as they are cut out of the stone, which runs, irrespectively of them, in regular courses. Around the porch the pilasters do not support arches, but merely a tabling, which is built to receive the eaves. In the eastern gable of the nave are the remains of an arcade above the one already described, which was built to take the form of the pitch of the roof, being stilted in increasing height to the centre. Above the tabling on the north side of the porch there would seem to have been a similar arcade to that on the east end of the nave, the central pilaster, which is moulded, yet remaining.

The chancel is entered through an archway with the usual characteristics of ante-Norman work. Its vast disproportion in size to the height of the wall is very striking. Above this arch, imbedded in the wall, are two stone bas-reliefs of angels. One of them bears what appears to be a cloth in his hands, and, from their position, it is probable that they formed part of a representation of the Crucifixion — an early form of rood-screen. Possibly the central part of the group was removed or destroyed, to make way for the chimney-stack above mentioned.

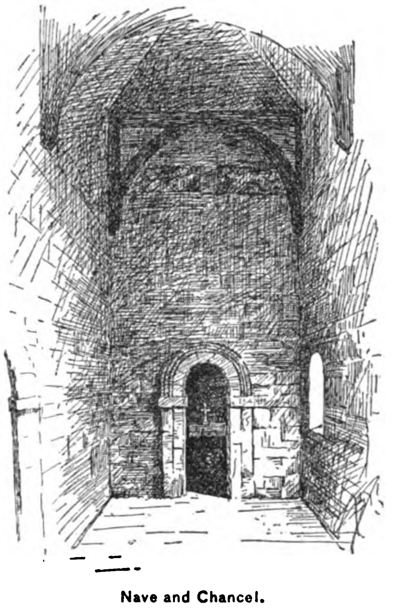
The pilasters on the east front of the chancel are moulded into three depressed roundels, the earliest form of decoration found in England. On the south wall is a circular-headed window.

The nave is entered through a similar archway, which springs from an impost, which is itself simply a plain string-course stopping a slightly-moulded pilaster formed by a series of segmental roundels. Above the impost, this is continued over the arch, as a hood-moulding.

The front of the porch seems to have been decorated, a moulded pilaster still remaining. So early an example of a porch — especially on the *north* side — is thought to be not only rare, but unique; and, from foundations and outlines of the roof being discernible, it is thought that possibly the church was originally cruciform, with a correspondidg porch, forming a species of transept, upon the south side. But as the approach to the building upon this side could only have been managed at any time by means of a flight of at least twelve or fourteen steps (the ground sloping down from the church to the river), this is, by some persons, considered to be doubtful.

Bradford Church.

Entrance from Porch to Nave.



Nave and Chancel.

The most remarkable features in the building are: its very great height compared with its breadth,— especially noticeable in the doorways; the figures of angels on the east wall of the nave[2]; the insufficiency of windows for light, and the method in which the external architraves are cut out of and on the surface of the stones, and not through them.

It was through Canon Jones's zeal and energy that the old church has been restored to its original condition and to its ancient uses, and one would like to see the effect of lighting it with pendant lamps during the celebration of the Divine mysteries. The vicar gathered funds to purchase the site and building, and vested them in the hands of trustees, who are bound, so far as their means permit (and they have no funds, unfortunately, save such as the public may from time to time give them) to preserve the church as a memorial of past ages, and for public benefit and instruction, regarding it always as a place dedicated to the worship and service of God, with permission to use or to allow it to be used for such purposes as by the majority may be approved.

The monastery of Bradford was part of the domain of the Abbess of Shaftesbury, second only in importance and wealth to the Abbot of Glastonbury, that earliest of communities, founded, as tradition tells us, by St. Joseph of Arimathea. So wealthy were these two

[1] For these and other particulars of the church, I am indebted to a monograph by the late Canon W. H. Jones, vicar of Bradford.

[2] Photographs of these bas-reliefs, which give a better idea of them than any drawing could do, show that they have all the characteristics of early Christian sculpture, bearing the remains of the Greek archaic style, which came to be welded, as it were, into Christian art during the first few centuries of our era, although Greek art itself had fallen into its decadence. If the remains of these heads be compared to the archaic Greek, which bears so much resemblance to the Assyrian type of feature, it cannot but strike us that there is much similarity. Whether angels were ever portrayed with beards in early times it is impossible to say, but the chins seem to have the remains of beards.

abbeys, that the country people had a proverb that "if the Abbot of Glastonbury might marry the Abbess of Shaftesbury, their heir would have more land than the King of England." Probaby, during the Danish invasions, the monks of St. Laurence had been dispersed

Angels over the Chancel-arch.

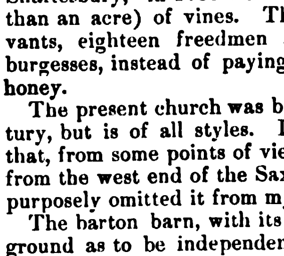
by the enemy; but in 1001 Ethelred bestowed the monastery and *vill* (*i. e.*, the manor) upon the Abbess of Shaftesbury as a recompense, in Leland's words, "of the murderinge of St. Edward his brother"—a deed of which the king was supposed to be not wholly innocent, although it was carried out by the order of his mother, Elfrida. The charter of this gift is to be found in the Harleian MSS. of the British Museum, and is interesting to antiquaries as marking out distinctly the boundaries of the manor. It states that the king gives to the Church of St. Edward at Shaftesbury the monastery and *vill* of Bradford, to be always subject to it, that therein might be found a safe refuge (*impenetrabile confugium*) for the nuns against the insults of the Danes, and a hiding-place, also, for the relics of the blessed martyr, St. Edward, and the rest of the saints. But, in spite of Bradford being (possibly in consequence of its wooded surroundings) an *impenetrabile confugium*, it was discovered by the Danes, and laid waste within a few years of Ethelred's charter. On St. Brice's day, 1002, an indiscriminate slaughter of the Danes took place, in spite of the king's promise of peace, and it was probably retaliation for the royal treachery that led to the destruction of the monastery.

Wiltshire must have been happier in its climate at the time of the Conquest than now, for, under the head of "Lands of the Church of Shaftesbury," in 1086 we find at Bradford an *arpen* (something less than an acre) of vines. There were forty plough-lands, nine servants, eighteen freedmen and twenty-four hog reeves; and some burgesses, instead of paying money-tax, paid each seven quarts of honey.

The present church was built about the middle of the twelfth century, but is of all styles. It is close to the old church—so close that, from some points of view, the tower and spire seem to spring from the west end of the Saxon church, and, for this reason, I have purposely omitted it from my sketch.

The barton barn, with its Early English roof, so framed from the ground as to be independent of the walls, was built in the earlier years of the reign of Edward I. A chapel dedicated to the Blessed Virgin was situated on Torry (*Tor*, Anglo-Saxon for high hill or tower); but all that remains now is the east wall and window, and a niche of very elegant design. Below the ruin is the Lady-well and well-close, marking the spring which supplies the town.

Leland, visiting Bradford in 1540, speaks of the bridge, which had "nine fair arches of stone"; but he says naught of the chapel thereon. Some persons have thought this to be a toll-house for the collection of moneys for maintaining the bridge, but Aubrey (who wrote two hundred years ago) says expressly: "Here is a strong and handsome bridge, in the midst of which is a little chapel, as at Bath, for masse." Chapels were frequently built upon bridges to receive the devotions of passers-by, and contained the image of some saint or patron whose intercession was asked against storms and tempests. As examples, the reader may recollect the smallest bridge at Luzerne and the old bridges of Bamberg and Prag.



Plan of the Church.

The chapel is built upon the central pier on the eastern side. It is almost square in plan, and rests on some good and bold graduated corbelling overhanging the "cut-water" of the pier. The eastern end appears to have projected still farther into the stream, so as to form a recess for a figure—perhaps of the patron saint. Concerning the dedication of the chapel there is no authentic record. The "fish" which forms the vane at the top of the chapel is, probably, the old ecclesiastical emblem of our Blessed Lord,—the *ichthus*,—the letters of which are the initial letters of other Greek words, signifying "Jesus Christ, the Son of God, our Saviour."

CONSTRUCTION.[1]—XX.

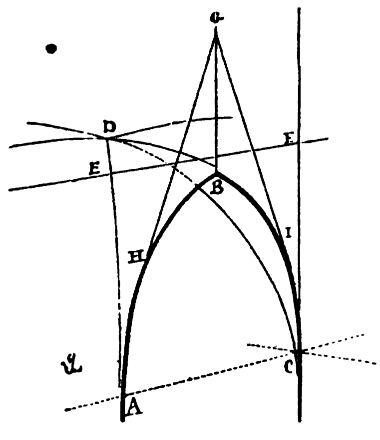


Fig. 107.

WE must now retrace our steps somewhat. In Ile-de-France, as we have already observed, we could not point out the boldness of the Burgundians at the beginning of the thirteenth century, or that of the architects of Champagne at the end of that century, when these latter could use large materials, hard, close-grained and resistant, like the stone of Tonnerre.

The builders of Ile-de-France make scarcely any of that open-work, formed of a single stone, those partitions pierced with openings: they keep the stability of their edifices less by rigid surfaces and supports than by weights accumulated at the points which seem to them to present an insufficient base.

We find a remarkable proof of this fact, from the middle of the thirteenth century, in the great constructions.

We have seen that the Gothic architects had arrived, in vaulted edifices, at considering the wall-arches as relieving-arches and at taking out the structure under these wall-arches, so as to keep only the piers. They did away with the walls as being a useless accumulation of material between these piers, since the latter had to receive and to support all the weights; but these wall-arches, not being weighted at the key, might deviate from the perpendicular, because of the pressure and the thrust of the rows of filling stones in the vaults which they supported.

Let us remark (Fig. 107) that the wall-arch *A B C* at the apex of its two branches, at the key *B*, where this pointed arch shows the greatest flexibility, receives the very last rows of stones in the filling *B D*, which have a slight thrust from *D* to *B*, because of their curvature.

It might happen that the apex *B* would be thrust out of the vertical, if not made immovable. To build a wall upon this arch *A B C* could strengthen the arch very little, since the two triangles of masonry *A E B* and *C F B* press far more upon the haunches of this arch than its key *B*. The surest plan was to load the key *B*. Hence the builders arrived, by the middle of the thirteenth century, at building outside, upon the wall-arches of the vaults, gables *H I G*, of masonry, framing the apertures and thus rendering, by this additional weight *B G*, the summits of the wall-arches immovable, or at least stable enough to resist the thrust from the keys of the vault-fillings *B D*.

One of the first attempts of this kind is seen in the Sainte-Chapelle-du-Palais, at Paris.

Let us observe that the architects of Champagne, who had adopted wall-arches of strong resistance because of their great thickness, since they were real pointed cradle-vaults, to receive the fillings of the vaults; and that the Burgundian architects, who detached their wall-arches from the outer partitions, leaving between them and these partitions a rather broad space supported by the courses of the crowning piece, had no need to resort to the artifice explained in Figure 107.

It was only in Ile-de-France, Beauvoisis and Picardy that we see, toward 1240, the adoption of this means of giving stability to the wall-arches. Thus the differences in the character of the architecture of the various provinces of France, in the thirteenth century, are nearly always to be explained by a necessity of building. If any one wishes to learn about the usefulness of these gables, regarded generally as ornaments, he must examine Figure 108.

But architecture is an imperious art. As soon as you modify one of its members, as soon as you add anything to the arrangement, you see the difficulties of detail accumulating. A first change in the system, which you suppose trivial at first, demands a second, then a third, then a crowd of others. Hence you must either go backwards, or become the slave of necessities which you have evoked by a first attempt, or a first concession.

One struggles against these successive difficulties which seem to arise in proportion as he overcomes them. In days when idleness of mind is regarded as a virtue, men treat these perilous attempts as

[1] From the "*Dictionnaire raisonné de l'Architecture Française*," by M. Viollet-le-Duc, Government Architect, Inspector-General of Diocesan Edifices, translated by George Martin Huss, Architect. Continued from No. 893, page 71.

vicious tendencies, as forgetfulness of sound doctrine. But the architects of the Middle Ages and especially of that period which now occupies us, would never have thought that a step backward or a repentance was in progress; they felt that they were led by their own principles and they solved courageously each of the new difficulties which they were continually raising.

To surmount the wall-arches with triangles of stone, in order to weight their keys, means at first only a little more stone and a little more handwork. But there must be gutters upon the wall-arches, and balustrades above the gutters; these gutters must rest upon the arches and not upon the filling of the vaults; the slopes of the gables must themselves throw off the water in some way; these rigid lines must be embellished; and this new member added to the architecture must find a place without intruding upon that of other indispensable members.

Figure 108 explains how the builders at the middle of the thirteenth century were able to reconcile at once both the purely material requirements and those of Art.

They set over their wall-arch *A* (see the section), often strengthened and doubled by an archivolt *B*, having the thickness of the filling-stones of the vault, about two-thirds of the width of these arches, the solid gable *C*, leaving a shallow notch at its base in order to fit in the gutter *D*, set over the remaining third part of the width of the arch. The gable being detached, this gutter had a dripstone overlapping the cornice, as seen in *E* and received the balustrade, as usual, in a groove.

Two stones *F*, carrying a cistern and gargoyles, were placed at the base of the gable to collect the water falling upon the roof-pieces of these gables. These roof-pieces, made in long sections to avoid seams, were cut according to the outline *G* and beneath the cornice were imbedded in the tympanum and were provided, behind the crockets, set in grooves, with a little furrow *I*, suitable for collecting the water and guiding it to the cisterns of the gargoyles.

Above the cornice these roof-pieces were then cut according to the drawing *H*, throwing off the water in front and behind. A head-piece *K*, made in one piece of stone, maintained the extremities of the two inclined roof-pieces, as also the branches of crockets. The balustrade *L* was set behind, level with the rear surface of the gable, in order to make way for the rows of crockets *M* inlaid in the grooves. Later they completely hollowed out these gables, which appeared too heavy to the eye, above such light mullions in the windows. This example shows how each new member added to the Gothic architecture led to a series of details, studies and combinations.

Some one will perhaps tell us that the efforts here are too great for the causes that evoke them; the criticism will be just, but it is too severe. In the natural order of things how many complicated

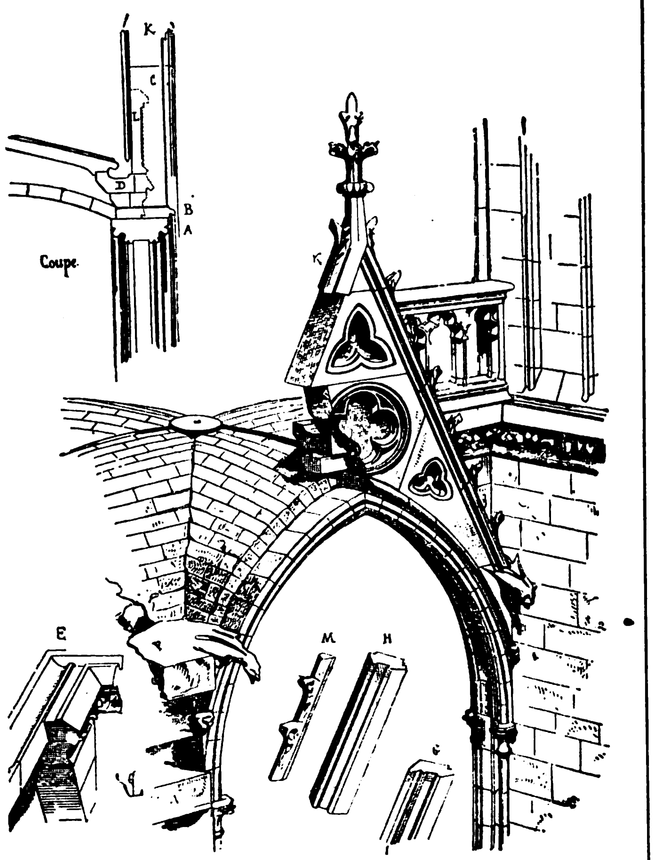


Fig. 108.

arrangements do we not see, how many details, how many long and powerful efforts to produce apparently trifling results? It is not we who created the world, who presided over its ordering and if things are well arranged in it, we must yet grant that this arrangement is far from simple.

The architects of the Middle Ages will admit a criticism that might be addressed to the great Orderer of the Universe. These architects, like their predecessors, had inert matter to work upon; they had to submit to the laws of attraction and resistance and to take account of the wind and rain. In the presence of inert matter

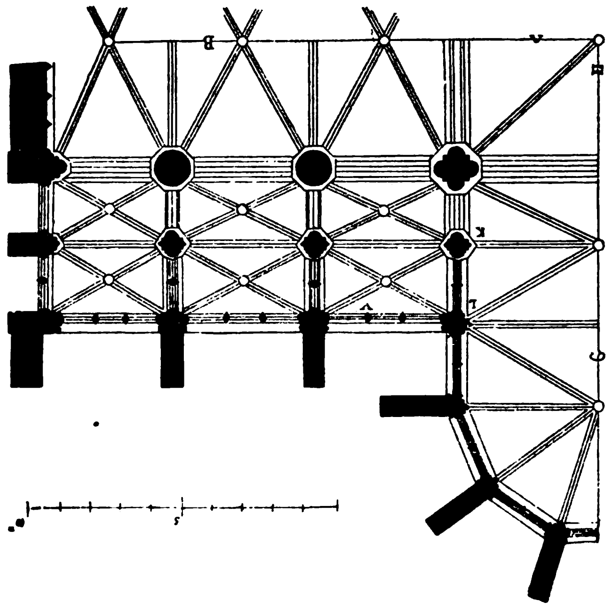


Fig. 109. Choir and Transept of St. Nazaire, Carcassonne.

and the action of natural forces, they believed that equilibrium was the true law of construction. Perhaps they deceived themselves; but it will at least be admitted that they deceived themselves like men of genius and there is always some good to be gained from men of genius, even when they are deceived. Moreover, it must be conceded that the more man seeks the more he combines and complicates matters and the sooner he ascertains the weakness of his judgment. Here are *rationalists* (if I may use the term), artists who follow a principle, ready to accept anything in conformity with the strictest rules of logic; who take, for building, freestone, that is to say, a substance shaped in such a way as to be set in courses; hence the principal lines in their construction must be horizontal. But no; after half a century of attempts of combinations, each more ingenious than the preceding, they come, on the contrary, to making the vertical line predominate, in their edifices, over the horizontal and that too without ceasing for an instant to follow the consequences of the true principle, which they have laid down. Many causes conduce to that result. We have mentioned some, as, for instance, the utility of stones set upright to make buildings rigid, or the necessity of weighting the points of support liable to be forced out of their vertical by oblique thrusts. There is a last point which has its importance: in the cities of the Middle Ages space was limited. Every city, because of the feudal system, was fortified, and they could not move the fortifications of a city every ten years; hence it was necessary to enclose the monuments in narrow spaces and to take up as little room as possible.

Now, if you build by a principle which makes all the actions of your structure oblique and if you cannot take more space, you must make up by vertical weights for the room which you lack on the surface.

A law originally imposed by necessity and endured as such, soon becomes a habit and a need; so much so that even when one could get rid of it, he submitted to it, it became pleasant and entered into his customs.

From the time that the architects of the Middle Ages learned that the structure of their vaulted buildings required them to multiply the vertical weights so as to resist all oblique pressure, they freely accepted the situation and, as in an edifice, either the horizontal line must necessarily prevail over the vertical, or the latter over the horizontal, unless they wished to have a real checker-board pattern. They ended by suppressing the horizontal line almost entirely, keeping it only to indicate the level of the stories, to show a resting-place within, or a floor. Also, carrying their principles always farther and farther, the master-workmen, at the end of the thirteenth century, show clearly, on the outside of their edifices, the interior arrangement and in this we should do well to imitate them. If we examine the outside of a Gothic building we can say whether it is vaulted in stone or roofed with timbers.[1]

Its pinnacles indicate to us the number of its interior supports; its bands, the levelling-stones above the vaults; the strength of its buttresses, the force of the thrusts and their direction; its win-

[1] In this regard and to show how far opinions upon architecture are false to-day, we shall here quote the opinion of a man, otherwise very enlightened, who, seeing the outer buttresses indicated in a plan, wished to have the architect suppress them, for the reason that the *progress* of construction ought to do away with these appendages, applied to buildings in barbaric ages and showing nothing but ignorance, etc. One might as well say that we are too civilized to be truthful and that falsehood is the most certain mark of progress.

dows, the number of wall-arches and compartments; the shape of the roof, the perimeter of the various halls, etc.

At St. Urbain of Troyes, already, the different members of the structure are so delicate and they have each a function so clear and independent, that the architect assembles them, but does not bind

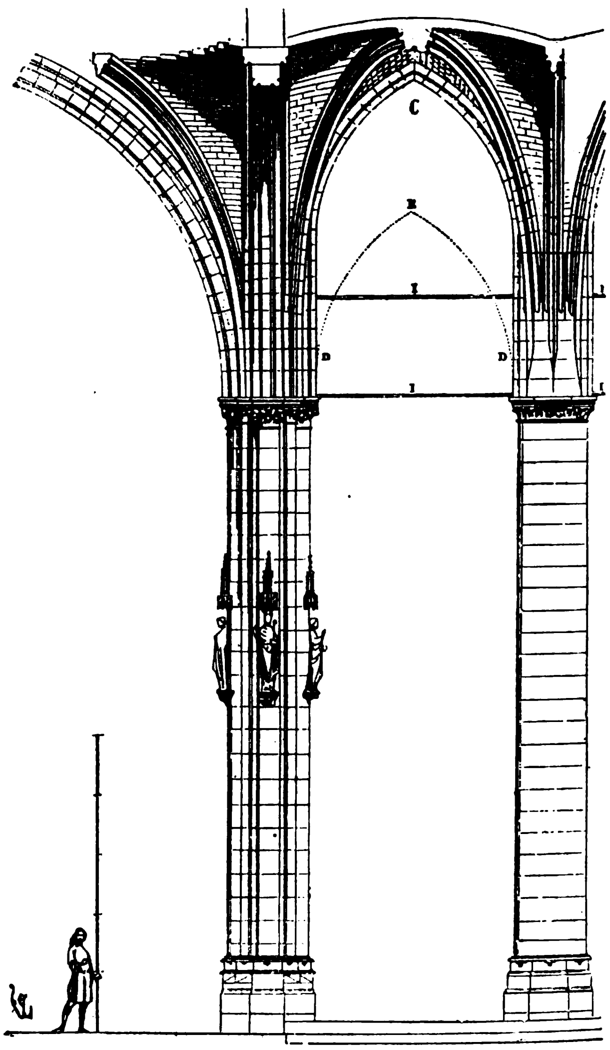


Fig. 110. Transept Arch, St. Nazaire, Carcassonne.

them together. He places them one beside another, keeps them together by mortising and fitting them in, as in joining; but he avoids binding them, for this produces homogeneity of all the parts and this the builder fears in using a system where every part of the structure acts, resists, — has its own action and resistance, — an action and resistance which can be effective only so far as they are independent.

At the beginning of the fourteenth century this system of allowing to each member in French construction its own function and of uniting these members in accordance with the individual function of each, is carried to exaggeration. This is very evident in a highly interesting monument, built from 1320 to 1330; we refer to the choir of the church of St. Nazaire at Carcassonne, one of the rare original conceptions of a period during which the art of architecture had already fallen into the use of formulas and cast aside every new attempt, every individual expression.

The careful examination and analysis of this monument have revealed a fact interesting to us to-day: it is the simple method followed by the architect and his subordinates for building a structure seemingly very intricate and apparently requiring a fabulous number of operations and drawings. In reality the difficulties of arrangement do not exist. This structure is merely a collection of vertical planes, whose horizontal projections need only a simple drawing each. It must be admitted and well understood, first of all, that the architect knows what he wants, — that he actually *sees* his building, under all its aspects, before laying the foundations; that he has looked out for all the different parts of his construction; that he has done, before cutting the first stone, all the work that we do upon an edifice when measuring and studying its final details.

Gothic architecture is exacting upon this point and perhaps this is what brings it most of its enemies. It is so consoling to say, when a difficulty meets us on the spot, "We shall see about that when we come to the plastering." It is so painful, when everything is not provided for in advance, to listen every day to a long series of questions from the stone-cutter or the overseer, — questions which must be answered clearly and simply, as by a man who knows what he is going to do and has foreseen everything that can possibly be required.

Accordingly the architect of the choir of St. Nazaire at Carcassonne made not only the plan of his edifice, not only the elevations and cross-sections, but he knew beforehand, the exact point where the various arches spring, meet and intersect; he drew their profiles and knew exactly upon what they were to rest; he knew the results of the thrusts, their direction and their force; he estimated the weights and reduced the pressures and the resistances to their most exact limits. He knew all this beforehand and he must have known it from the time when the first course was placed above ground.

His conception being thus complete, fixed on paper and in his brain, his subordinates go blindly forward. He says to one: "Here is the design of the pier *A*, repeated twice; this is the design of the buttress *C*, repeated ten times, etc.; here is the drawing of the window *A*, repeated six times and of the window *B*, repeated seven times; here is a branch of a pointed arch with its stones of impost, of a transverse arch with its imposts, etc." This being said, the architect can go away and let all the courses and the parts of each member be cut out. The cutting finished, a master-setter comes, who, without possible mistake, has all these different pieces taken up and put into their places, like the pieces of a well-planned machine. This mode of procedure explained how, at this period (at the end of the thirteenth century and during the fourteenth century), French architects had monuments erected in countries where, perhaps, they had never set foot; how from Spain, from the south of France, from Hungary and from Bohemia, requests came for designs of monuments by these architects; and how these monuments could be built and exactly resemble, save in some details of profile and sculpture, the edifices built between the Somme and the Loire.

The choir of the church of St. Nazaire at Carcassonne was probably erected thus, with the aid of plans furnished by an architect of the north, who perhaps never visited the city.

Our reason for this opinion is that, evidently, the architect has avoided every difficulty requiring a decision on the spot; those difficulties which one solves, not by a design, but by explanations given to the stone-cutters and workmen in the very work-yard while watching their work and taking, if necessary, the gauge, the rule, or the square and apylying it to the design. The architect, for instance,

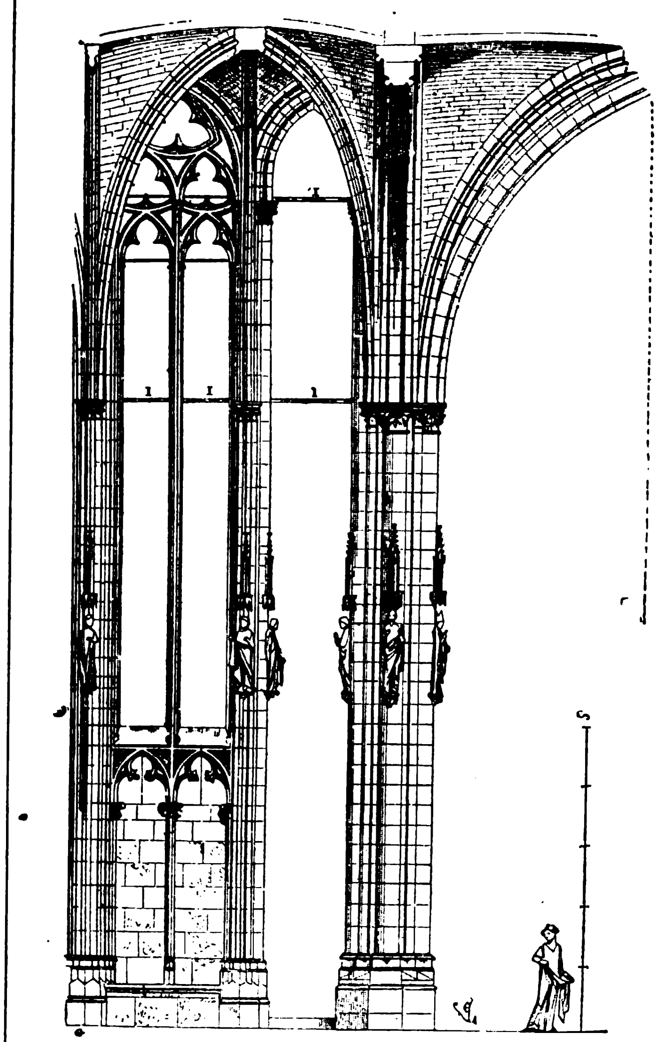


Fig. 111. Choir Arch, St. Nazaire, Carcassonne.

has almost entirely, in the vaults of this edifice, given up imposts common to several arches; he has given the curve of each of these arches and their profiles; each has been cut without regard to the adjoining arch and the master-setter has arranged all this like a game of patience. But in order that the singular method of

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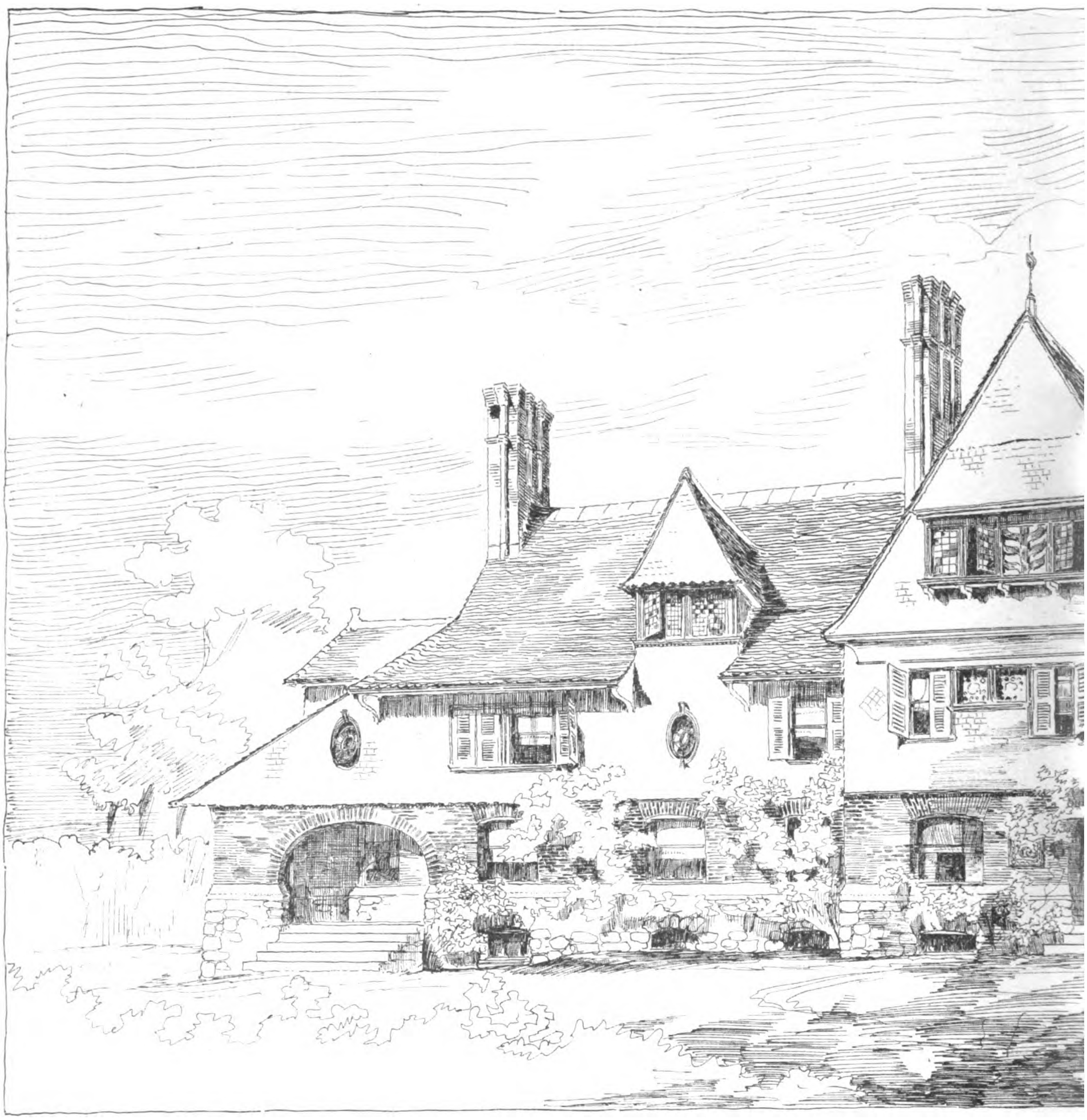

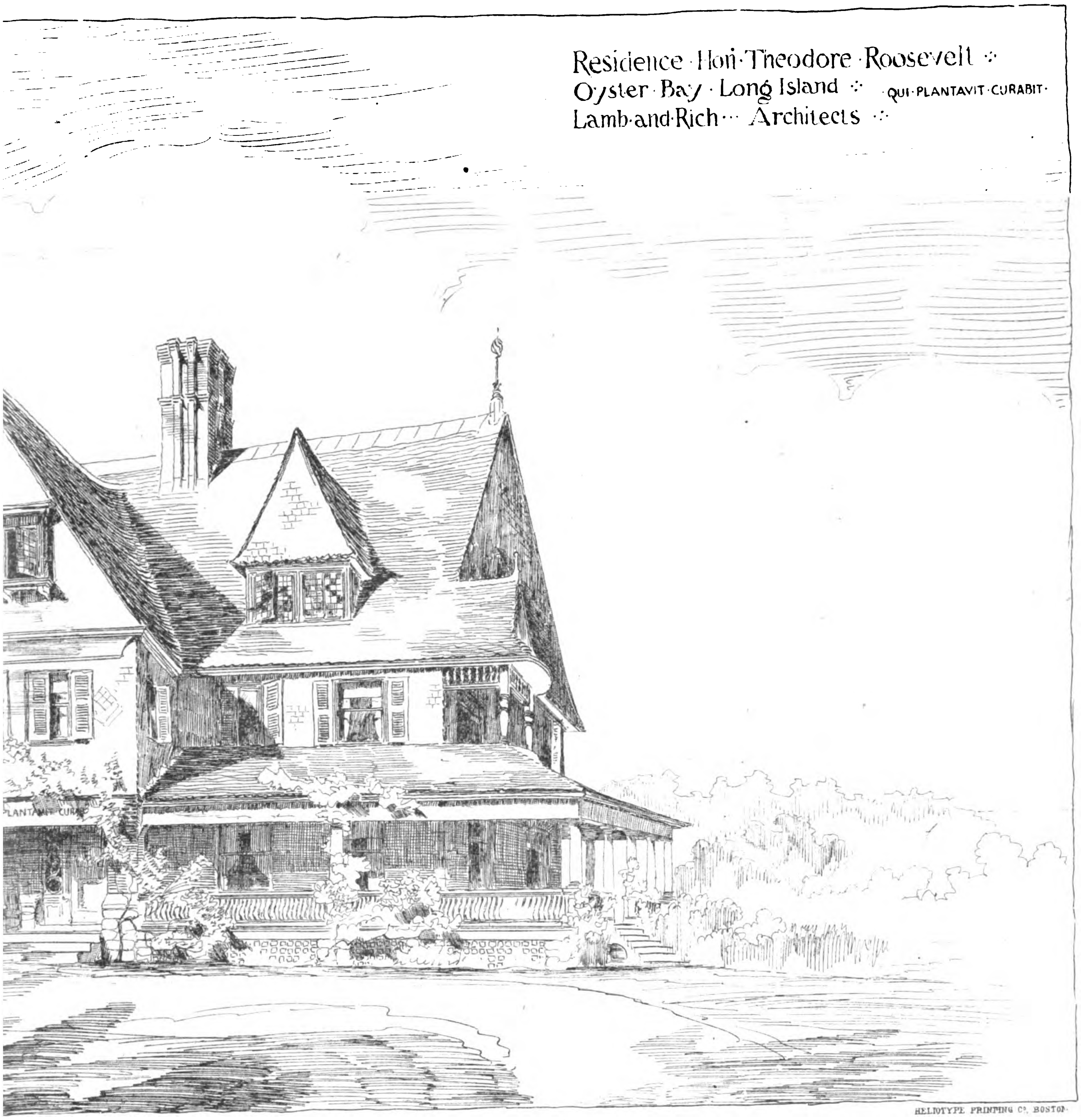

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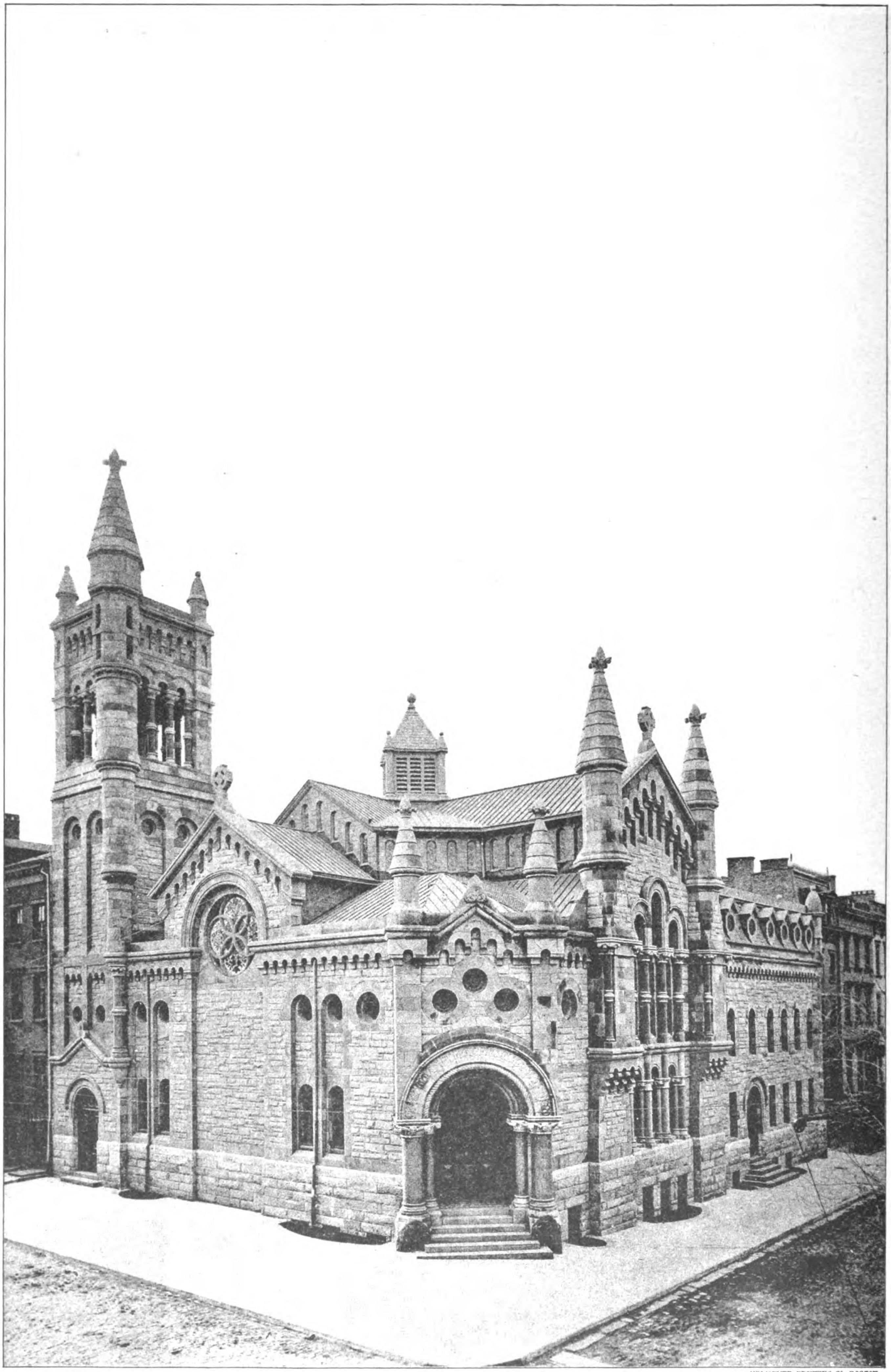

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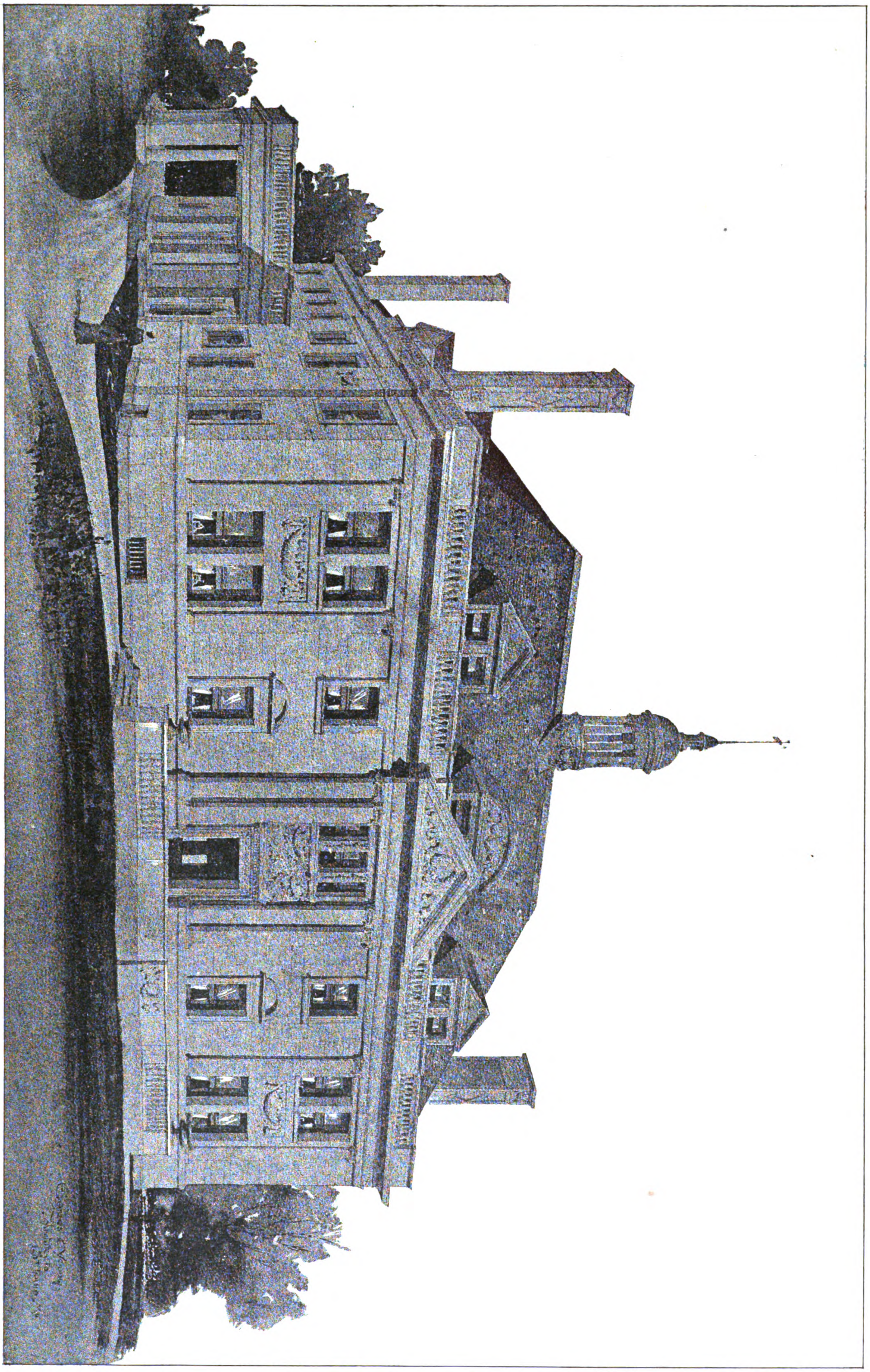

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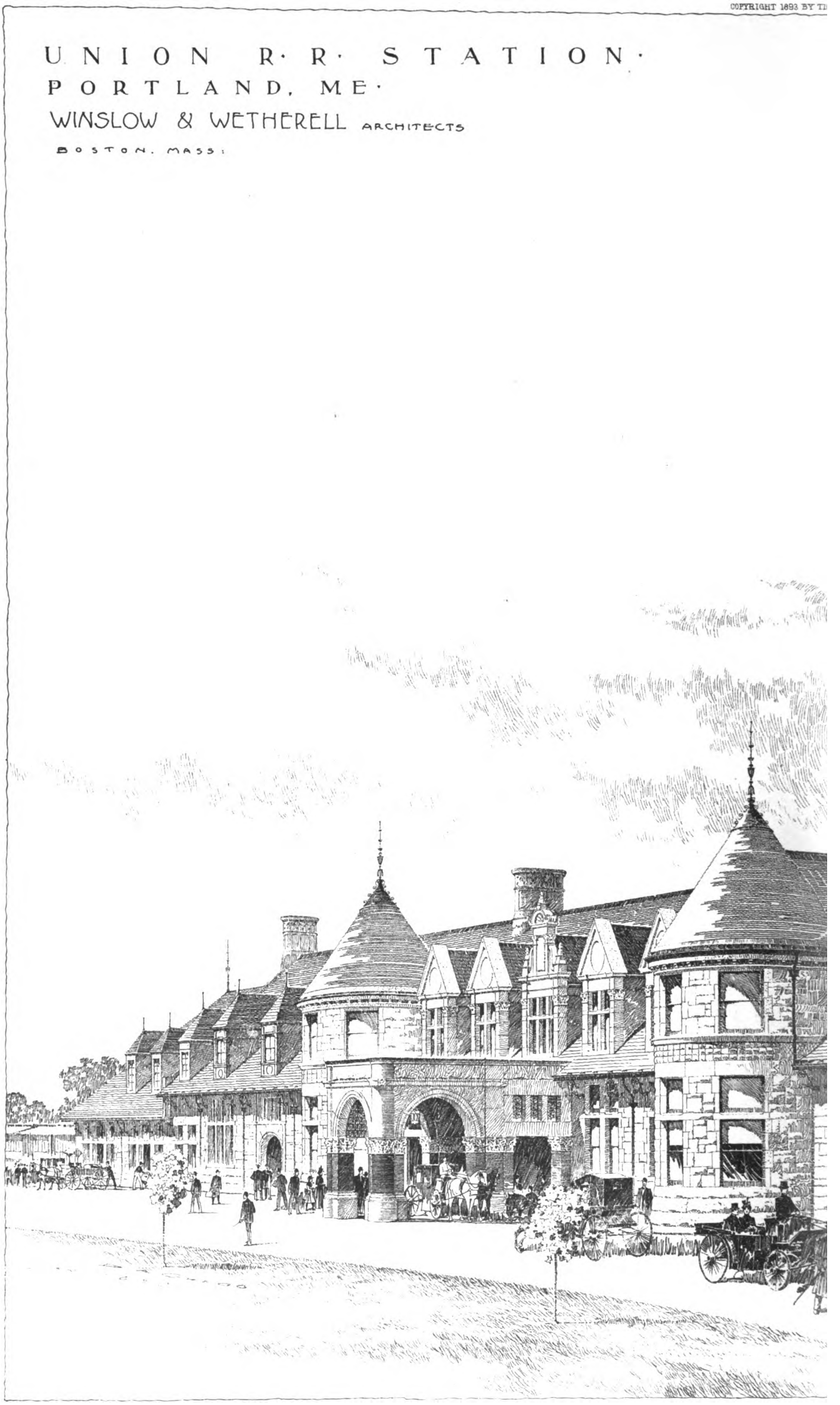
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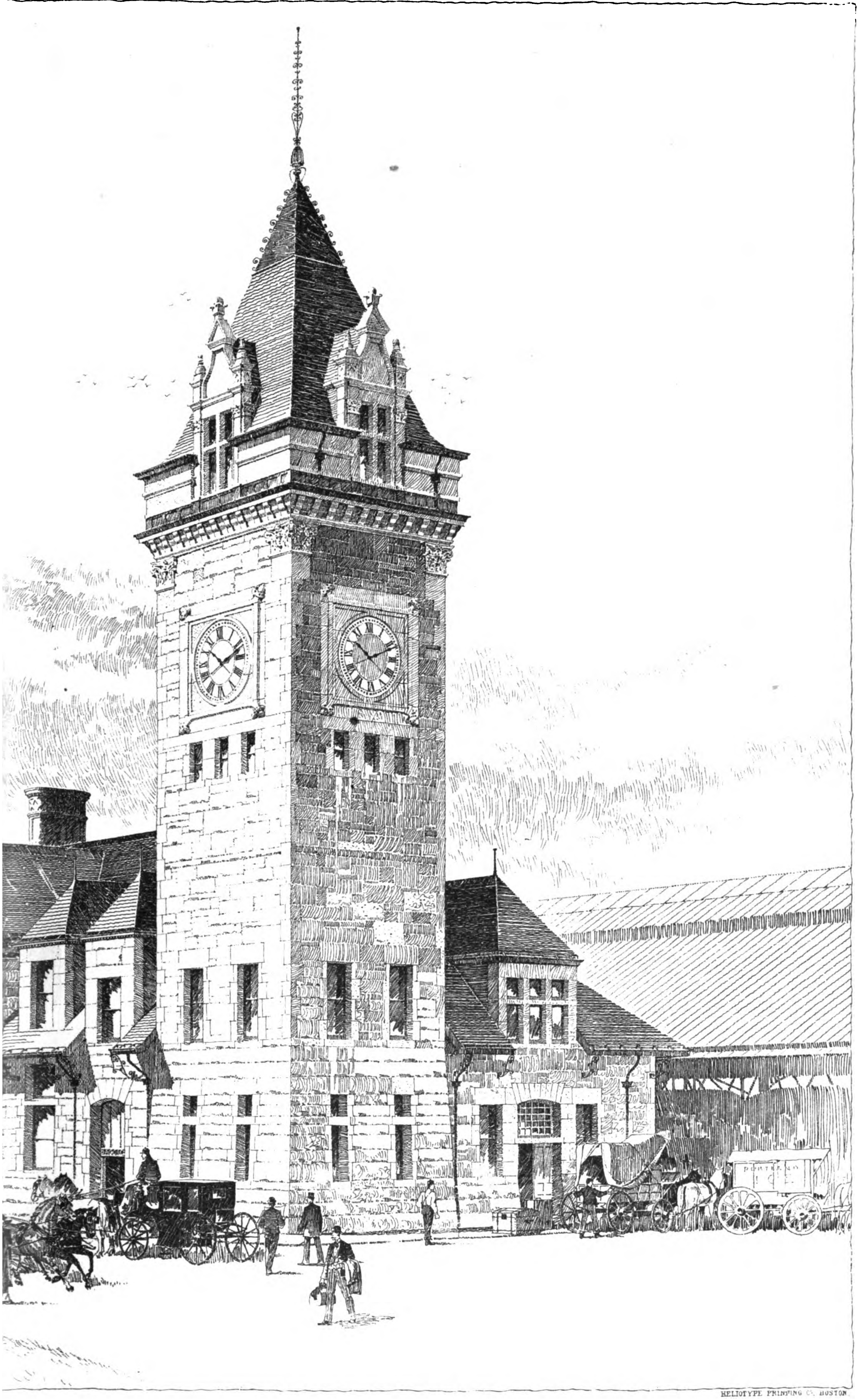

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construction used in the choir of the church of St. Nazaire at Carcassonne may be appreciated, it is best to give, first, half of the plan of this choir with its transept (Fig. 109).

We see in this plan the horizontal projection of the vaults; they have all their keys on the same level, or nearly so, although their

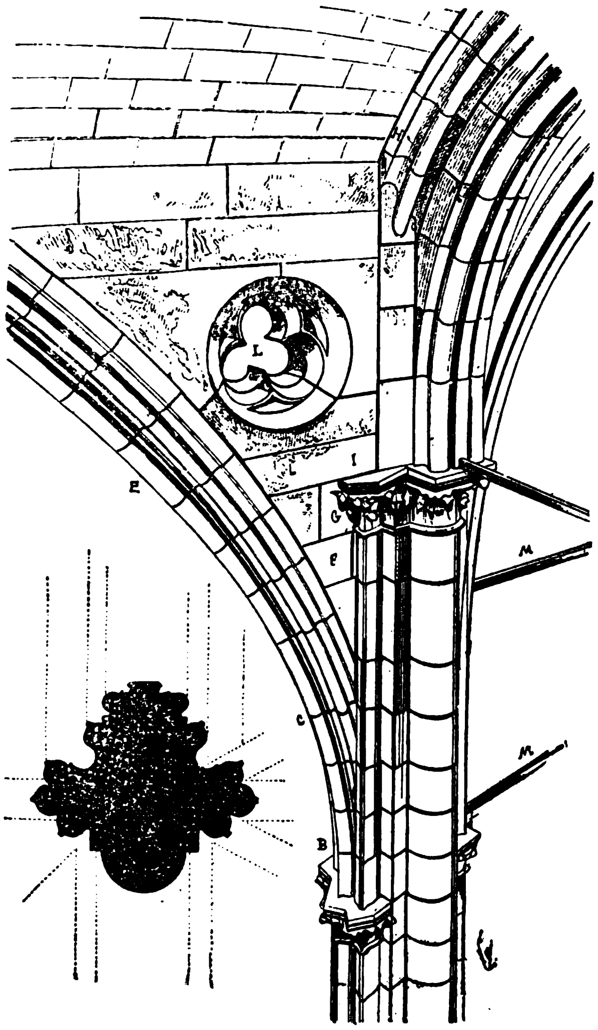


Fig. 112. Choir Pier, St. Nazaire, Carcassonne.

dimensions and forms are not alike; so, necessarily, the springings of these arches are found on very different levels.

We must also see the general section of this building through *A B*. The architect had thought of closing the vaults *C* (Fig. 110) at a level below that of the great vaults of the chancel and of the transept; and the structure had been so built up above the springing of these low vaults, as seen by the dotted lines *D E*.

But the architect had to yield to the desire for greater effect, by raising the keys of all the vaults to the same level. Perhaps a requirement from the clergy caused the adoption of this latter course; but certain it is that the low starting-points, indicated by dots, were cut off at the surface of the piers, as can be easily seen and that these springings were raised, as indicated in our drawing, in order to have through the whole extent of the edifice windows of equal height.

Figure 111 gives a section through the line *G H* of the plan.

Let us at once notice, that, to hinder the buckling of these slender piers, subjected to the unequal thrusts produced by the elevation of the secondary vaults, the architect has fixed bars of iron, *I*, 0.05 centimetres square, to be seen in our two sections and that the stone used is a hard and resistant limestone, which permitted them to place the vaults upon these slender supports.

Let us now examine with care the details of this structure; let us take the summit of the pier *K* (of the plan) at the point where that pier receives a large intermediate transverse arch of the chancel, two archivolts, a transverse arch of the chapel and two branches of pointed arches.

The horizontal section of this pier (Fig. 112) is drawn at *A*.

From *B* to *C* we see four courses of stones to receive the large transverse arch.

Starting from the section *C*, normal to the curve of the transverse arch *E*, the voussoirs of that arch are independent and the pier rises behind the filling *F* of that arch, without being attached to it, up to the capital of the wall-arch *G*. The projection of this capital forms a connection with the filling and then the pier rises, again independent, up to its meeting with the wall-arch *H*.

Above the capital, *G*, the filling rises vertically from *I* to *K*. It is pierced by a trefoil, *L*, which ornaments the bareness of this triangle, receiving the vaultings of cut-stones.

The two bars of iron *M* serve as ties between this pier and the one adjoining and maintain the thrust of the transverse arch *E*.

Let us take the adjoining pier *L* of the plan, that of the entering angle, which is located between three windows and which receives a large transverse arch, two branches of the great pointed arches of the principal vaults and a third branch of a pointed arch from the chapel (Fig. 113). It is again seen that here the drawing of each part has been made independently of the rest and that the arrangement shows only the fewest possible connections, in order to avoid too complicated designs. This independence of the different members of the vaults, in falling upon the piers, allows great elasticity to the structure, — an elasticity necessary in a monument so light, very high and very unevenly weighted. It can, in fact, be affirmed, that in the choir of the church of St. Nazaire there have been torsions and considerable movements, without destroying any of the solidity of the building.

Once more, these are not examples to follow, but useful ones to know, because of the simple and practical means put in operation.

In Figure 114 we see the outer side of the same pier. We are placed in the angle of the chapel, at the point *V* of the plan; we suppose the upper mullions of the great window of this chapel to be taken away.[1]

At *A* is seen the bar of iron which maintains the tops of the pillars of these mullions and which serves at the same time as a tie for the springing of these arches [see "*Meneau*"]; at *B*, the groove reserved for setting the open-work centering of the mullions; at *C*, the stones of impost of the wall-arch that encloses the window-frame of cut-stone; at *E*, the branch of the pointed arch of the chapel-vault, whose courses of impost are mingled with those of the wall-arch.

At the starting from the bed *D*, the voussoirs of that pointed arch are independent.

At *G* is the archivolt surrounding the carved open-work centering of the first window in the chancel and filling the place of wall-arch of the interior; at *F*, the archivolt wall-arch of the mullions without glass, separating the chapel from the choir. Here it will be observed that this arch *F* is moulded even in the part hidden by the masonry of the entering angle behind the pointed arch *E*, which proves in the clearest manner that each member of the structure was separatley outlined and cut in the work-yard after partial designs and that these different parts thus prepared by the stonecutter were put into place by the setter, who alone knew each of their functions and their relations with the whole of the structure.

The mason filled the gaps remaining between these interlacing, interpenetrating members, all remaining free.

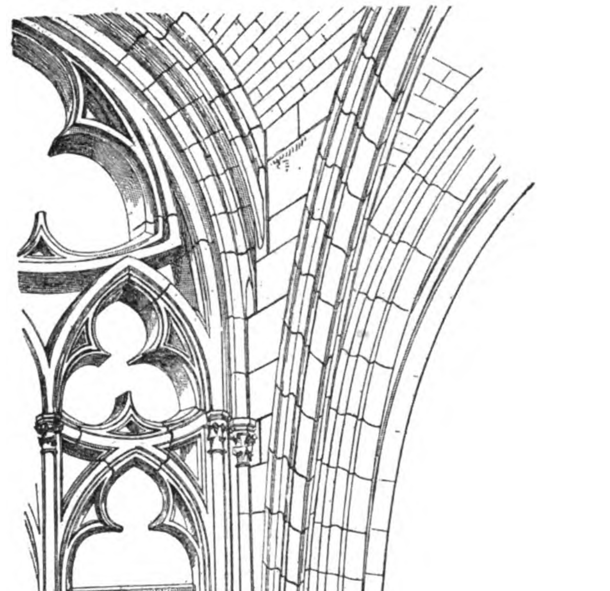


Fig. 113. Choir and Chapel Pier, St. Nazaire, Carcassone.

We have drawn at *K* the horizontal projection of that entering angle, with the intersection of the two archivolt-wall-arches *G*.

[1] This operation having taken place under our eyes, we have been able to ascertain very exactly, and here reproduce, that construction.

Such a structure consists only of piers holding elastic but resistant groins, supporting the fillings of the vaults, or maintaining the sashes of stone in the large grooves.

It shows us that the master-builder could leave nothing to chance, postpone nothing; that he could foresee everything from the first course, classify his designs methodically and that he needed, when once the stone was cut according to the designs and the pieces ready, only to give instructions to a skilful stone-layer, who took successively all the parts of the structure and put them in order into their places, as the master-carpenter takes, one by one, the pieces of timber, cut in advance, in order to raise them to their places.

To-day people proceed otherwise: they collect the blocks of stone, often without knowing very definitely what form they will finally take and they cut in these same blocks the intersections of the voussoirs and the mouldings, as one might do in a homogeneous mass, without very much anxiety about the beds and joints that fail to coincide with the given forms. Is this better? Is this the means of obtaining a more solid structure? We beg leave to doubt. We can affirm, on the contrary, that it is less reasonable, less skilful, less intelligent and more costly.

There is no religious construction of the Middle Ages more advanced than that of the churches of St. Urbain of Troyes and

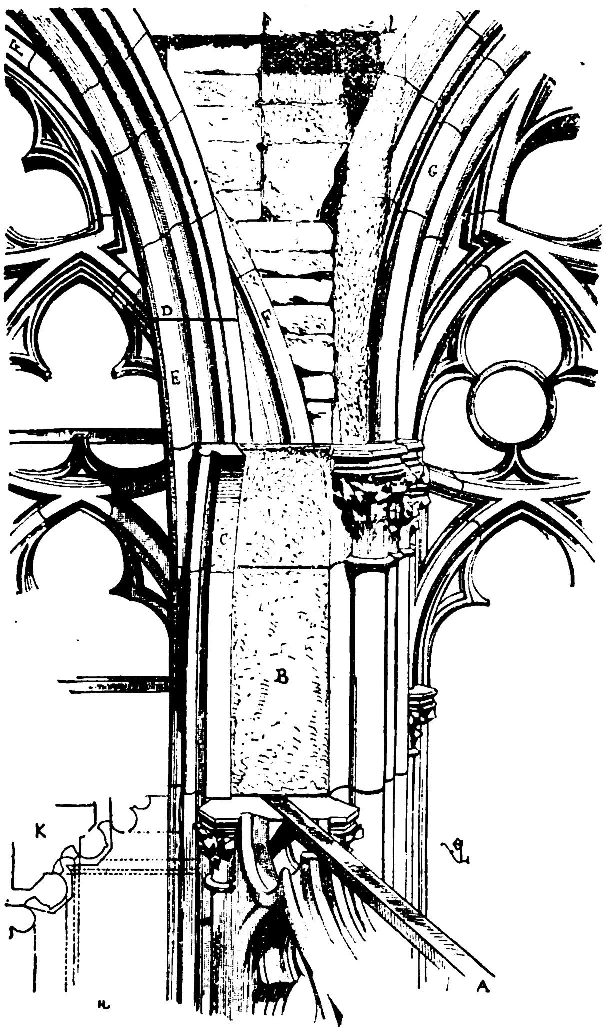


Fig. 114.

St. Nazaire of Carcassonne, in the path opened by the architects of the thirteenth century. They could not, in truth, go farther without substituting metal for stone.

It is doubtful whether the architects of the fourteenth century were checked by that impossibility, or whether their fruitless efforts had proved to them that they had already passed the limits imposed by matter: in any case a reaction took place about 1330 and the builders abandoned these too-bold methods to return to a wiser system. But this reaction ended by destroying originality; they came to formulas. At that period we see the builders casting aside, in the vital parts of their structures, that simultaneous use of stones set upon their bed and against the stratum, which had furnished the builders of the thirteenth century with such beautiful subjects for decoration. They keep the forms prescribed by this system, but no longer appreciate the reason for them and, losing something of the adventurous spirit of their predecessors, they give up the stones set against the stratum as a means of rigidity for the supports and return to structures built in courses, reserving the stones set against the stratum for mullions and inlaid arching,— that is, for the architectural members supporting no weight and serving only as window-sashes or decorations. Still, as if to follow, in appearance at least, the consequences of the system devised during the thirteenth century, they multiply the vertical lines and wish that not only the members of the vaults, the arches, shall have each its point of support, but even the mouldings with which these arches are ornamented. Hence there results between the form given to the piers, for instance, and the construction of these piers, the most evident contradiction. In fact, the builders of the fourteenth century return to heavier forms, although they try to disguise that reaction under an apparent lightness, by multiplying the slender members of the architecture. As workmen they are very clever, very prudent, experienced and skilful, but they entirely lack invention. They have no more of that boldness which indicates genius. They are wiser than their predecessors of the thirteenth century, but they have the defects which often accompany wisdom; their sure methods, their formulas, are stamped, despite all their efforts, with a wearisome monotony.

One of the most striking and most complete examples of religious construction in the fourteenth century is the Cathedral of Narbonne, whose choir only was built from 1370 to 1400.[1]

It is the work of a consummate master of the art, though lacking in that imagination, those unexpected resources which charm us in the constructions of the thirteenth century and which lend themselves to the most varied conceptions.

What gives the architects of the fourteenth century this degree of practical skill was that repairing of the lower structures, those partial reconstructions made in the older edifices. At this period the materials used are always of the first quality, the design learned, the arrangement excellent and the cutting executed with remarkable care. Otherwise the general system of construction is modified very little, but is applied with more sureness and with perfect knowledge of active and passive forces, of thrusts and weights. The flying-buttresses, for example, are well drawn and set just where they ought to be. We have a very clear proof of this in the Cathedral of Paris. All the flying-buttresses of the nave and of the choir were rebuilt at this period (toward 1330), and rebuilt so as to clear the galleries of the first story and fall upon the large outer piers [see "*Arc-Boutant*," Fig. 59, "*Cathédrale*"].

These flying-buttresses, which have a very long radius and hence a curve very slightly marked, have been calculated with an exact knowledge of the function they had to fulfil and when we reflect that they had to be rebuilt under new conditions and resting upon old structures, we are obliged to recognize in these builders of the fourteenth century a great experience and an uncommon skill.

We do not believe that we need continue longer upon the religious constructions of the Middle Ages, for we shall teach our readers nothing new, after what we have already said.

The articles in the "*Dictionnaire*" state elsewhere the differences resulting from the improvements in detail, added by the architects of the fourteenth and fifteenth centuries, in religious constructions.

We shall now devote ourselves to the civil and military constructions, which proceed after their special methods and have but little relation to the construction of edifices purely religious.

(To be continued.)

EXHIBITS FOR THE WORLD'S FAIR. — SOME PICTURES THAT WILL BE EXHIBITED. — THE ACCIDENT TO THE TORONTO WATER-WORKS INTAKE-PIPE. — *The Canadian Architect and Builder.*

A CONFERENCE of the various Provincial Commissioners of the Dominion for the World's Fair, Chicago, was recently held in Ottawa for the purpose of allotting to each Province its share of the space allowed to Canada as a whole. A report was presented from each Province showing what had already been done towards collecting and preparing for exhibits, and in the subsequent allotting of space each Province was allowed a position according to the quality of its exhibit, the Provinces making the best exhibition having the most prominent positions. It seems that the shape of the space allowed to Canada in the Mineral Building is somewhat peculiar, making it rather a difficult matter to arrange satisfactorily; but it was finally decided to give Ontario the whole frontage on the main aisle — 2,250 square feet out of the total of 6,500 square feet. The entrance to the Ontario section will be the main entrance to the entire Dominion exhibit. Ontario has the largest exhibits in agriculture, educational matters and stock, especially with regard to stock, as the other Provinces will not exhibit any

[1] It should be said that in France we have not a single large edifice complete, in the architecture of the fourteenth century. The thirteenth had left no great monuments of this class to be built and the fourteenth could only finish edifices already begun, while they had no leisure to finish the small number founded by themselves.

sheep or swine. Ontario and Quebec only will exhibit cattle and horses. In forestry, Ontario and British Columbia will have about an equal space, while in fruit Ontario has secured about 2,000 square feet. Dr. Selwyn, chief of the Geological Survey Department, considers that Ontario has the finest mineral exhibit ever collected on this continent. He will make an exhibit from the Geological Department showing the rock-formation from which the various specimens are taken. From British Columbia will be sent a very fine exhibit of minerals, which will convince the public generally of the immense wealth of that Province in the more valuable varieties. The shipments of grain and minerals will begin early this month.

The Ontario Society of Artists' winter exhibition was of more than usual interest this year, as from this collection paintings from Western Canada were to be selected for the Chicago Fair. The committee appointed to make the selection was, unfortunately, composed of a number of artists, and, naturally, their calling made it a difficult matter for them to avoid the appearance of partiality. Had they really sent the best paintings, it would have seemed as if they had favored some artists more than others, which would have been a result only natural, when the very "amateurishness" of many Canadian artists is taken into consideration. The forty pictures they have selected comprise a large variety of subjects, and it has been suggested that, in order to get over their difficulty, they made this, rather than excellence of work, the condition of choice. The largest canvasses were chosen, altogether apart from merit, evidently, for "A Peasant-girl Drinking" is about as crude and wooden a production as could be, a thoroughly amateur piece of work, by Charles Alexander; but it is of the same size, or thereabouts, as E. E. Thompson's ghastly "Waiting in Vain," described in a recent letter, and "The Foreclosure of the Mortgage," by G. A. Reid, which is a commonplace subject, figures life-size, illustrating a very sad but not uncommon incident — a plain subject plainly treated, without a shadow of poetry, or even artist's license, to redeem it.

It is greatly to be regretted that many really good paintings are not to go, such, for instance, as F. A. Verner's "Ojibway Wigwams" and "Sioux Encampment," except that in his case he will be well represented by his "Cattle at Milking-time," in oils, and his "St. Clair Marsh" in water-color. These two are certainly the best, in every way, of all in the gallery. The latter has been exhibited in the Royal Academy, London, and other European galleries, and is a clever representation of the sun just dipping below the horizon, a great red ball, over the marsh, from which rises the evening mist, diffused with the sun's glow. The late Paul Peel's picture, the "Venetian Bather," a nude child, life-size, returned from her bath, and standing before a large mirror in which her figure is reflected, is probably the finest piece of flesh-painting ever produced by a Canadian, and it is well worth a prominent place. Mr. Forbes's unfinished picture of shipwrecked mariners on a raft should have had a place, but being unfinished it appears to have been barred on that account. It is a large canvas and strikingly depicts the terrors of the storm and the misery of the occupants of the raft. A feature upon which much labor and skill are displayed is the light of the lantern with which they attempt to signal a distant vessel, but it is open to question as to whether shipwrecked sailors would be likely to have a lantern, or be able to light one in such a raging storm if they had it. Portrait-painting is not a success, judging from the specimens on view. One of a young lady by E. W. Grier is coarse and very funereal. The subject is arrayed in black, sitting in a black carved-oak chair of peculiar design, and the background is also very dark. One would not object to the blackness had the subject anything to relieve it, but the result is that the lady looks ghastly ill. "Christobel," a scene from Coleridge, is a charming piece by Mrs. Screiber, of a character that one seldom sees attempted here. Among the most noticeable of the water-colors are several views from the Rocky Mountains, but the grandeur of the subject has generally been too much for the artist, and the pictures seem to need a great deal more work upon them than has already been given, although they exhibit a considerable amount of skill and painstaking.

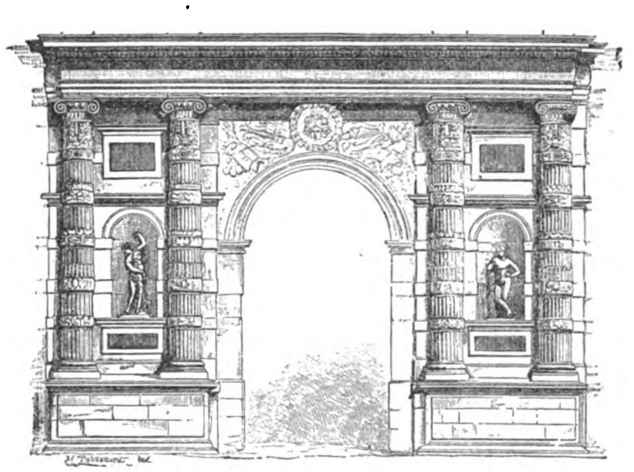
Two charming pieces of landscape by C. M. Manly should not pass unnoticed. Mr. Manly has a very delicate touch and his forte seems to be the representation of sunlight on open stretches of heather and other moorland accompaniments. His "Land of Peach and Vine" and "Heather Land" are really excellent. It is to be regretted that none of Mr. L. R. O'Brien's (late president of the Canadian Royal Academy) pictures are on view. There is certainly no Canadian painter to touch him in the execution of his works. A recent exhibition of his pictures was a treat to see: his landscapes and water-scenes are exceedingly beautiful. Being a member of the Canadian Royal Academy, his paintings have gone down to Montreal.

A month or two ago I mentioned the water-works' trouble at Toronto, — the bursting of the great conduit-pipe that lay at the bottom of the bay, and brought the lake-water to the city. It was then supposed that the repairs necessary could be temporarily effected now, and properly completed and the pipe sunk to its original position when the ice had gone. Now, however, it is stated by the city engineer, an authority on water-engineering, that it is more than probable the conduit is beyond repair, and that nearly a couple of hundred thousand dollars have been practically and actually thrown into the water.

It is suggested that a second conduit would be advisable, even if it is found that the present one can be patched up, and, probably, with new engines, a new conduit, a renewal, in fact, of all existing plant, which has already cost the city hundreds of thousands of dollars, Toronto might have a good water-supply. Was ever a more iniquitous state of things heard of? It seems that a year ago a contract was let for a new lining of iron to the pumping-well at the city end of the conduit: the material was made, supplied and delivered, but up to the present has never been put in, and the reason given is that it was necessary in order to give the city its required daily supply of water that the engines should not be stopped to allow of the lining being renewed, although it was absolutely necessary that a new lining should be put in. Here is a city of 200,000 inhabitants, which has expended fabulous sums on its water-system, so dependent upon the pumps for its every-day supply that the engineer in charge dare not stop them for one day for necessary repairs, lest there should be a water-famine; and yet there is a ten-acre reservoir capable of holding enough water to last the city for a month; but for all the outlay it is now rarely full, and mysterious leaks carry away a considerable quantity of that pumped up into it. It was actually stated, on authority, that the cause of the diminution of the water of the reservoir was that so many people left their taps running at night to prevent freezing. As a matter of fact, very few people do think of turning on their taps at night, but if many actually did so, it would be a very small reservoir that could be emptied by such means. It is certainly rather an unusual thing in these days to find restaurant-keepers advertising that they receive daily supplies of pure water from the neighboring country, but that is actually a fact here, and citizens are continually warned of the necessity of boiling all water before using.

The *Canadian Architect and Builder* begins the sixth year of its life with a special number designed to celebrate this important event in its history, and certainly the editor deserves great praise. The "New Year Number," as it calls itself, presents a specimen of journalism better than has heretofore been produced in Canada. The cover was specially designed by a Toronto architect, and is a clever piece of design; the illustrations are intended to be representative of Canadian progress, and give views of prominent buildings in Toronto, Quebec, Hamilton, Ontario, and Halifax, Nova Scotia, while the body of the paper contains a number of special articles by architects in the various Provinces. It is not too much to say that the members of the architectural associations of Ontario and the Province of Quebec are thoroughly satisfied in having guaranteed their influence towards the support of the journal, and the journal has proved a very satisfactory medium for the propagation of principles of self-defence, for which both these associations were formed, while at the same time builders and contractors have, through its columns, been supplied with a vast amount of practical information which they could not have obtained in any other way. Professional journals of other countries will be glad to know of the success that their contemporary has met with, and may take encouragemet from the result of the venture. The annual convention of the Ontario Association of Architects is being held at the time of writing, so that we must hold over an account of its proceedings to another month.

THE MAIN QUADRANGLE AT THE WORLD'S FAIR.



Detail from the Tuileries by Philibert Delorme. From *L'Art.*

FROM a rather interesting and quite impartial discussion of the World's Fair buildings in the New York *Tribune*, we make the following extract:

Eliminating the Mines Building from the main court for the sake of argument, — although it has a frontage on an unimportant portion of the latter, — the structures to be touched upon at this end of the grounds possess so many characteristics in common that the coherence of the unit which they combine to make is to be dwelt upon before their individual qualities. The height of the Administration Building has been alluded to. It is the loftiest building in the court, as the portico of the Exposition should be. The buildings grouped

with it are longer, wider and, naturally, lower. The Administration Building is 262 feet square. The Electricity Building measures 345 by 690 feet, the Liberal Arts Building is 787 by 1,687 feet, the Machinery Building is 494 by 842 feet, and the Agricultural Building is 500 by 800 feet. Both the Machinery and Agricultural buildings have annexes of considerable size. Above the cornice each building has points which differ radically from those in any other structure, and the result is a sky-line that, with a reservation to be noted below, is of delightful variety. Beneath the cornices there are differences of design, but when the court is viewed as a whole they are less marked. The effect then is as of a vast quadrangle surrounded by arcaded structures on the three sides overlooked by the front of the Administration Building, the arcades being kept in scale by an adherence in all the buildings to the same measurement from pier to pier, and being saved from monotony by the independent treatment of details. Thus it will be seen from the sketch of a fragment of the Agricultural Building that on the side shown therein — the west side — the pavilion on the angle is open and the spaces between the columns which support the arches on the right are closed. The conditions are reversed on the north side of the building, and, while the corner pavilion is closed, the succession of single-story columns extending from it to the entrance pavilion in the centre, a succession only interrupted twice by a wide solid pier with double-story pilasters, is left open and the wall which it screens is recessed so as to leave a broad walk. Across the basin where the south end of the Liberal Arts Building faces the Agricultural Building the entire spaces between the central and corner pavilions are filled with double-story flat columns bearing round arches just beneath the cornice, and with the separation between the first and second stories marked by a flat arch thrown from the middle of one column to another. The second-story openings are glazed. The first are left open and from corner to corner the promenade is unbroken, the central pavilions being connected with the arcades by a continuous passage.

To return to the broad relations of these buildings: The Administration Building could be made massive because in length and breadth it is the same, and could be carried to any height. The Machinery, Agricultural, Electricity and Liberal Arts buildings are all greater in length than in width, and far greater in both length and breadth than in height. Free to raise their roofs by the aid of iron trusses and such expedients, the architects of these buildings were yet obliged to keep their cornice-lines down to a uniform standard of about sixty feet. With long, low façades to produce, therefore, it was out of the question to conceive them in a massive style, as Mr. Hunt was at liberty to conceive the pavilions of the Administration Building. It was imperative to give them as much lightness and elegance as would be compatible with their pseudo-solidity. The frequent use of the Corinthian order, sometimes pure and sometimes modified, and a general reference to Classic architecture, — which at its grandest still may be said to have elegance, — furnished the solution of the problem. It would be hard to imagine a statelier quadrangle than these buildings form, — the rows upon rows of columns in the Machinery and Agricultural buildings framing the right-hand side, those of the Liberal Arts Building and the pilasters of the Electricity Building filling in the scene on the left, and the peristyle, or arcade, at the foot of the court, joining a triumphal arch in the centre to the simple Italian music-hall and casino on either side, thrown out boldly and distinctly against the steely clouds that hang over the lake. The ornament is nowhere excessive but, on the contrary, is generally excellent in itself, and applied with taste. The effect is at once rich and refined. The sculpture particularly and the painted decoration, which need to be considered in greater detail than is possible upon the present occasion, lend incalculable animation and charm to the designs which they adorn.

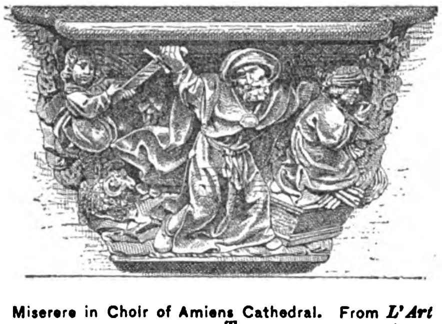
One thing that has contributed much to the harmonious effect of the buildings in the court is the policy followed by the architects in regard to the projections requisite to relieve the long stretches of their façades. By common consent these have been confined to the porticos in the centre of each side of the different buildings and to the pavilions at the corners. The former are, of course, more pretentious than the latter, but all are characterized by the moderation which is the key-note to the architecture of the court, and all are monumental — all, that is, with the exception of those of one building. The exception invites a short discussion of specific points in the court. All things considered, the court is such a triumph of architectural proportions that a blemish here and there is comparatively of no consequence, but it cannot be disguised that if the quadrangle has one weak member it is the Electricity Building, designed by Messrs. Van Brunt & Howe. The coöperation of its pilasters with the columns of the Liberal Arts Building to form an *ensemble* on the north side of the court has been referred to favorably, and is really creditable, but the success of this coöperation has been due more to a respect for the rules as to measurements, and the relations of arch-spans, cornices, etc., than to accomplishment in design. The design of this building lacks grace, lacks beauty of outline, lacks most of all largeness of style and dignity. Its conspicuous features are a number of towers rising from the cornice to various heights and surmounted by lanterns and domes. These are commonplace and ungraceful enough in themselves: combined with certain other features their effect is hardly to be lauded. For example, the main entrance, which faces on the court, is marked by an immense arch that springs from a point as high as the cornice of the building itself. Above the arch is a pediment of generous dimensions, and above this is a heavy attic with a horizontal top. As has been observed, the entrance is not truly monumental, and the reason is that below the cornice it is kept flat, not sufficiently emphasized, and behind the arch it is built in the form of an alcove, or niche, which increases the feeling of flatness. But the pediment and attic give it great heaviness, and to balance the mass — for it is a mass — the architects have provided at each corner a belfry, as aforesaid. The sky-lines of the building are restless without being picturesque. The surfaces of the façades are broken up by piers and columns with commendable regularity, but with no special ingenuity or artistic skill. Fortunately this is one of the smallest buildings on the court, and it is powerless to seriously disturb the effect of the latter.

If the touch of piquancy aimed at in the Electricity Building had been attained with perfect success nothing in the court could have commanded warmer praise, for it serves to link the Administration Building with the Liberal Arts Building on the north side of the court, as the Machinery Building serves to link it with the Agricultural Building on the south. The transition from the academic but gorgeous Administration Building to the more severe structures which border the lower sides of the court could not have been better effected than through buildings also academic, but treated with an occasional picturesque note. Messrs. Peabody & Stearns have proved this in the Machinery Building. Their arcade on the first story is formed of rusticated piers, and above these runs a loggia, or open gallery, with a series of columns supporting its roof. The result is thoroughly dignified, but a profusion of modelled and colored decoration, especially about the wall of the loggia, makes it very animated. The corner pavilions, slightly projected from the line of the façade, repeat the scheme of the arcade and loggia, but are crowned with domes. The main entrances, of which one has a columnar portico crowned by a pediment, and the other a portico crowned by a dome, are likewise made picturesque by being flanked by towers of which the stages above the cornice are designed in the freest Renaissance style. The rich Corinthian capitals are being picked out in gold; so are the great names in the history of mechanics which are inscribed on the frieze, and in its present spotless state this building — which is the last one finished on the court, and therefore the freshest — is as sumptuous as it is monumental.

The basin filling the lower half of the court has two arms, flowing north and south, which separate the Machinery and Electricity buildings from the Liberal Arts and Agricultural buildings. Between these canals and the Peristyle which shuts off the lake the Liberal Arts and Agricultural buildings have each the entire frontage on their respective sides of the court. Both are the most classic structures on the grounds, after the Art Building, which cannot now be discussed, and both have been designed with such fine scholarship — the Liberal Arts Building by Mr. G. B. Post, and the Agricultural Building by Messrs. McKim, Mead & White — that, although they are unlike each other, they balance each other supremely well. Mr. Post's lake front is once again as long as the longest façade of the Agricultural Building, but the greatest front of the latter is equalled by that shortest front of the Liberal Arts Building, which it faces, and, entrance for entrance, corner for corner, the pavilions of the two buildings give answer to each other's proportions. On the north a Roman triumphal arch with three openings rises in the centre of the Liberal Arts façade, and similar arches of but one opening each adorn the corners. They are composed with splendid Corinthian columns. On the south the end pavilions of the Agricultural Building, built up solidly with pilasters, are emphasized partly by the profile of the projecting columns and pediment shown in the sketch of the west front, and partly by a sculptured attic, and the group called "The Horoscope," which stands on the roof. The main entrance, with its colossal columns and a pediment, is made prominent by a low dome roofing the noble rotunda through which admission is gained to the Exhibition Hall, — a rotunda now such a net-work of scaffolding that only the rough grandeur of its dimensions can be appreciated. The "Diana" by Mr. St. Gaudens, which was formerly poised upon the Madison Square Garden tower, is on this dome.

Mechanical Thumbs. — Two men got into an argument the other day over the expansion of steam in a cylinder. "Why," said one, "you don't know anything about machinery and the principles of mechanics. Your thumbs are not shaped right." He then went on to explain that a man with long, thin thumbs did not have a mechanical turn, while those with thick thumbs, broad at the ends, were natural-born machinists. "I never believed in physiognomy," he said, "but I do believe in thumbs. Now, thumbs have been appreciated ever since the world began. The ancients used to call the thumb the "other hand." Barbarous kings used to swear and make compacts by their thumbs. In Rome it was a sign of favor to wring and kiss the thumb, and of disfavor or disgrace to lift it up or turn it outward. A man who was hurt in his thumbs was excused from serving in the Roman wars. Some of the scoundrelly citizens used to cut off their thumbs, so as to remain home and get rich. Teachers used to punish their pupils by biting their thumbs. Oh, the thumb is a great and an influential member! I can look at the thumb of a young woman and describe her figure. I can tell whether she is thin and bony, or plump and round; whether her joints are large and ill-shapen, or small and perfectly proportioned. By examining a man's thumb I can tell what ought to be his vocation." — *N. Y. Tribune.*

EFFECT OF TURPENTINE GATHERING ON THE TIMBER OF LONG-LEAF PINE.



Miserere in Choir of Amiens Cathedral. From *L'Art pour Tous.*

IN Circular 8 of the Forestry Division, published about a year ago, it was stated that tests made on timbers of long-leaf pine, bled or unbled, lent countenance to the belief that bled, or tapped, timber did not suffer in strength by virtue of the tapping. Further tests and examinations permit now the announcement without reserve, that the timber of long-leaf pine is in no way affected by the tapping for turpentine. This refers to its mechanical as well as chemical properties, and hence even the reservation that it might suffer in durability is now eliminated, and any prejudice against the use of bled timber in construction wherever the unbled timber has been considered desirable must fall, as having no foundation in fact, being based only on vague belief, proved to be erroneous.

It is to be hoped that this fact will be made widely known among builders, architects and engineers who have hitherto made discrimination against bled timber, and thereby depreciated or discouraged the manufacture and impeded the sale of an article which answers all the purposes of construction, and the unrestricted use of which is dictated by true economy.

The basis for the statement regarding the mechanical properties is furnished by a series of tests comprising not less than 300 tests on 32 trees of this pine, bled and unbled, from various localities.

The somewhat puzzling fact that bled timber exhibited, if anything, greater strength in the tests, has been accounted for by the fact that the turpentine orchards are located mostly on sites which produce better-quality timber, as well as larger yield of turpentine.

To determine whether any changes in the chemical composition take place, a series of chemical analyses of bled and unbled timber has been made which indicates that the resinous contents of the heartwood are in no wise affected by the bleeding, — the oleoresins of the heartwood being non-fluid, the whole turpentine flow is confined to the sapwood.

Among other interesting facts regarding the distribution of resinous contents through the tree, which will be published in a separate bulletin, it appears that trees standing side by side, and, to all appearances, in similar conditions, show very varying quantities of resinous contents.

To make sure that experience did not, if sifted down, contradict the results of these investigations, a competent agent, Mr. F. Roth, visited turpentine orchards and saw-mills in the long-leaf pine region. He reports that nobody was found — although it was claimed by some — able to discern any difference in the appearance of the bled and unbled timber; that in spite of consumers' specifications for unbled timber, they are almost invariably served with a mixture without finding it out; that experience in the districts where bled timber is cut and used has not sustained the claim of inferiority.

This information is furnished in advance of the full report on the investigations in question in order to remove as quickly as possible the unwarranted discrimination against the product of nearly one million acres of Southern pine, which are annually added to the total acreage in turpentine orchards.

This result of authoritative investigation should be worth several million dollars to the forestry interests of the South, permitting readier use and sale for a product that, left uncut, endangers the future of the forest by the destructive conflagrations to which it is specially subject.

B. E. FERNOW, *Chief of Division.*

Approved:
EDWIN WILLITS, *Assistant Secretary.*

FIRE PROTECTION FOR THE WORLD'S FAIR. — There is a branch of the city fire department at the park, consisting of three steam-engines, four chemical engines, a water-tower, forty hose-carts, a thousand hand fire-extinguishers and a fire-boat, with sixty-five firemen to man them, while the Columbian Guard, consisting of five hundred men, under command of Colonel Edmund Rice, U. S. A., is always at hand to assist in case of emergencies. Much reliance is placed upon the Columbian Guard, which will be raised to its full strength of 1,800 men by May 1. The guard is made conversant with the use of all fire apparatus by a fire-drill three times a week, and is on the watch at all hours of the day and night. Smoking is rigidly prohibited on the grounds, and the offender who does not obey at once the order to put out his cigar or cigarette is hustled off to the police-station without ceremony. The city has established a police-station just outside the grounds, and here a justice sits to hear complaints against those arrested inside the Exposition enclosure. A force of police is also on duty to patrol that part of the city and render assistance to the Columbian Guard should it be necessary. — *Fire and Water.*

SOCIETIES

THE SKETCH-CLUB OF NEW YORK.

THE meeting held in the club-room Saturday, February 4, was largely attended, and of unusual interest, being the annual meeting of the Club. Twenty-four drawings were handed-in for the Miller prize for an exterior design of a country-house, from plans furnished, and six drawings for the Ackerman prize for pen-and-ink rendering of a carved panel. A criticism of the last month's competition, a hillside tomb, was received in writing from Mr. Thomas Hastings. N. Hauseman received first mention, Edgar A. Josselyn second mention. Officers elected for the coming year were as follows: Frederick R. Hirsh, *President;* James Ackerman, *Vice-President;* Edgar A. Josselyn, *Recording Secretary;* Frank H. Quinby, *Corresponding Secretary;* Harry L. Parkhurst, *Treasurer;* Edgar B. Bross, *Chairman of Current Work Committee;* Danford N. B. Sturgis, *Chairman of Entertainment Committee;* and J. Oliver Cummings, *Chairman of House Committee.* After the election, the members discussed the probable future alliance with the Architectural League.

EDGAR A. JOSSELYN, *Secretary.*

ILLUSTRATIONS

[*Contributors are requested to send with their drawings full and adequate descriptions of the buildings, including a statement of cost.*]

THE INDIANA STATE-HOUSE, INDIANAPOLIS, IND. THE LATE EDWIN MAY, ARCHITECT.

[Gelatine Print issued with the International and Imperial Editions only.]

SIX DESIGNS SUBMITTED FOR AN "EADS MEMORIAL ENTRANCE" TO THE ST. LOUIS BRIDGE IN A COMPETITION OF THE ST. LOUIS ARCHITECTURAL CLUB.

[Issued with the International and Imperial Editions only.]

IN judging the competition for the Eads Memorial Entrance to Bridge, there are, as usual, several matters to be taken into consideration. First, the surroundings: So far as can be judged from the plan and from some of the perspectives, the entrance is to be located in a portion of the city devoted to warehouses and manufacturing buildings. These buildings are likely to become, if they are not already, high, of simple broad scale and of almost brutal mass; therefore any entrance located in their midst, if it be desired to avoid the appearance of being out of place, must, if high, dominate its surroundings, or if low, must be extremely massive and broad in order to hold its own. At any rate, a delicate piece of architecture will seem lacking in proper character.

Second, the lines of the present bridge, though horizontal necessarily in general mass, are distinctly perpendicular in the details of the abutments, and suggest that while the mass may be considered a strong base, the tendency of lines of any buildings at the ends of this mass will be best if perpendicular.

Third, the choice of idea, whether a tower, a triumphal arch, or both: It seems to the writer that a dominant perpendicular mass, flanking an arched approach, is the best solution of the problem, and that in any event the masses must be broad in scale and the detail not too small. The designs marked "*Mike*" and "*River-view*" alone fulfil these requirements.

"*River-view*" — 5th Place [J. Willard Adams] — has a tower which is suggestive of a certain Garfield monument which should never have been a permitted design. This tower is made up of a jumble of square, cylindrical and truncated cone forms, with little relation to each other. The pedestals to the groups of horses are especially bad. The colonnade is a distinct obstacle to traffic and could not be allowed by any municipal government. The design is loosely and poorly rendered.

"*Mike's*" — 1st Place [Oscar Enders] — design is vigorous and simple in masses. It is somewhat uncertain at the left of the drawing, where the gable suggested is necessary to complete the composition, and yet does not seem to be incorporated in the design, but is to be left to the courtesy of the adjacent owner. The tower and arch are good. The canopy over the clock is rather crude, and, we are inclined to think, impossible in its present form, but it could easily be made good in studying the design. The long openings in the tower run a little too high, and do not leave enough surface from the crowns of the arches to the top of the parapet. The *tourelle* on the right should be roofed like that on the left, and this would close an opening which apparently weakens the buttress. The rendering is excellent.

"*Back number M. I. T.*" — 2d Place [E. A. Manny] — This is the better of the triumphal arches, but it is'nt very good. The large arch is too thin, has not sufficient depth of soffit. The footway

arches should be at least larger than the intermediate arches, and these latter seem to have no especial reason for being. The pediments are unnecessary. The columns are neither connected enough with the arch, nor isolated enough to have individuality, and they are too slight. The figures are too large for the columns. The arch is not sufficiently weighted above the cornice. The figures above the arch are meagre and sadly lack dignity. The spandrel decoration is feeble, and does not fill the spandrel, nor is it retained in a panel. The rendering is scratchy.

The other arch (unmarked) — 3d Place [J. C. Greene] — while sufficiently strong in mass, is commonplace and unstudied in detail. The pedestals for the groups project too far. The cornice lacks detail and the fascia is too small. The arch mouldings are weak. The key-stone is too small. The whole arch lacks base. The use of triglyphs in the fountain entablatures is out of key with the rest of the design. The terminal figure is too small. The rendering, though coarse, is fairly good.

Design marked with a kind of Caduceus. — 4th Place [Lewis Mullgardt]: — The tops of the towers, though probably too delicate for their surroundings, are good, but the lower parts of the towers need more wall-surface, and less proportion of openings. The suspended bridge seems an afterthought. A high triumphal arch between the towers would have been much better. The waiting-rooms, etc., are slight, and lacking in effectiveness. The rendering is good.

The last design — 6th Place [M. P. McArdle],— while sufficient for the gate-posts of an estate, provided the gates and fence supplemented them, is neither sufficient for, nor expressive of, a memorial entrance to a great bridge. The posts themselves are good. The rendering is fairly good, excepting the sky.

All the designs are, however, both in conception and rendering, much superior to the designs usually presented in competition for such a subject. There are no really bad ones.

The designs should be classed as follows: "*Mike*," "*Back-number M. I. T.*," "(*Unmarked Arch*)," "*River-view*" "(*Unmarked Design with Posts*)."

C. HOWARD WALKER.

HOUSE OF GEORGE L. ALLEN, ESQ., ST. LOUIS, MO. MESSRS. EAMES & YOUNG, ARCHITECTS, ST. LOUIS, MO.

THIS building, which has a frontage of 86 feet and a depth of 74 feet, is built of buff Bedford stone, with all moulded work — pilasters, cornice and other finish — of blue Bedford stone.

THE FIRST METHODIST-EPISCOPAL CHURCH [SANDS STREET MEMORIAL], BROOKLYN, N. Y. MR. JOHN WELCH, ARCHITECT, BROOKLYN, N. Y.

THE UNION RAILROAD STATION, PORTLAND, ME. MESSRS. WINSLOW & WETHERELL, ARCHITECTS, BOSTON, MASS.

HOUSE OF THEODORE ROOSEVELT, ESQ., OYSTER BAY, LONG ISLAND, N. Y. MESSRS. LAMB & RICH, ARCHITECTS, NEW YORK, N. Y.

[Additional Illustrations in the International Edition.]

DOOR IN A PRIVATE DWELLING, RUE BALLU, PARIS, FRANCE. M. DEZERMAUX, ARCHITECT.

[Copper-plate Etching.]

A FIREPLACE IN THE SAME HOUSE.

[Copper-plate Etching.]

THE elevations and a plan of this building were published in our issue for January 21.

SEAL OF LA SOCIÉTÉ DES ARCHITECTES DU POITOU ET DE LA SAINTONGE, FRANCE.

[Engraving.]

THE CHATEAU DE PIERREFONDS: FACADE ON THE COURT.

THE château de Pierrefonds being close to Compiègne, the late Emperor of the French could hardly fail to take an interest in the building. As a consequence, an immense sum of money was expended in restoring the ruins, or rather in a re-creation of the buildings as they were supposed to appear before Louis XIII destroyed them in 1616. The work was intrusted to M. Viollet-le-Duc, and probably it formed his most important commission as an architect, for the outlay was at least 200,000*l*. About three-fourths of the money was contributed by the Emperor. The remainder came from the Historic Monuments Commission. The château, like most of its class, served a double purpose. It was a residence as well as a fortified stronghold. But as there were no representations of the buildings in their perfect state, M. Viollet-le-Duc had to exercise his logic in order to infer what appearance they presented up to the seventeenth century. Practically he had only a part of the external walls to guide him. Opinions differ about the value of the restoration. Some approve of the architect's arrangements, but enthusiastic Gothicists maintain that Viollet-le-Duc was incompetent to realize the beautiful work of the old designers. His modern buildings, where he had free scope, have been subjected to very severe criticism, and it is held that at Pierrefonds he was not more successful than at Coucy or Paris.

HOUSE AT WILPSHIRE, NEAR BLACKBURN, ENG. MESSRS. STONES & GRADWELL, ARCHITECTS, BLACKBURN, ENG.

THIS residence, of which we illustrate the principal fronts, is now being erected at Wilpshire, a fashionable suburb of Blackburn. The whole of the building is faced with straight-cut parpoints from Lightcliffe Quarries, Yorkshire. The stone dressings are from Morley Quarries, Yorkshire. The roofs will be covered with Peake's "Perfecta" brown-red tiles. The site is elevated, and commands fine views from Yorkshire to the Irish Sea, and full advantage has been taken of this favorable prospect. The general contractors are Messrs. Marshall & Dent, of Blackburn, the contractors for the masonry and brickwork being Messrs. E. Lewis & Sons, of Blackburn.

HOUSE AT WITTON, BLACKBURN, ENG. MESSRS. STONES & GRADWELL, ARCHITECTS, BLACKBURN, ENG.

OUR illustration shows the west and south fronts of residence now being built in this favored part of Blackburn. The principal rooms command extensive views over the valley of the Ribble. The lawns, terraces and kitchen-gardens are all most suitably placed, having due regard to aspect and the contour of the land.

PROPOSED CLOCK-TOWER, WALTON-ON-THE-NAZE, ENG. MR. J. S. MOYE, ARCHITECT, WALTON-ON-THE-NAZE, ENG.

THE town of Walton-on-the-Naze might be made one of the most attractive watering-places in England, but rival interests have prevailed, and it is kept back. The clock-tower will, when erected, be effective in breaking the monotony of the sea-front, afterwards it may be expected that the neighboring houses will be transformed.

COMMUNICATIONS

[*The editors cannot pay attention to demands of correspondents who forget to give their names and addresses as guaranty of good faith; nor do they hold themselves responsible for opinions expressed by their correspondents.*]

THE U. S. TIMBER EXAMINATIONS AND TESTS.

WASHINGTON UNIVERSITY, ST. LOUIS, MO., February 4, 1893.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs, — Believing that your readers are interested in the results to be obtained from the elaborate series of Timber Tests and Examinations so auspiciously begun under the Forestry Division of the Agricultural Department, I wish to indicate how they may now greatly assist in hastening the work. There have been two very small annual appropriations, under which the work proceeds very slowly. One *Bulletin* (quarto, 60 pp. and 6 plates) was published about a year ago, describing the scope of the investigation and the methods pursued. Another is now in press, giving results of tests on long-leaf pine (Georgia pine). This is probably the most valuable timber in America for structural purposes. Its strength is about twice that of white-pine, and in large sizes it is superior to oak. It has also been shown that the timber which has been "boxed," or "bled," for turpentine is in no way inferior to that in its natural state.

It is proposed to study all the principal species of timber used for commercial purposes, selecting five trees of each species from four or five different localities, making in all twenty or twenty-five trees of each species. The logs from these are shipped to the undersigned at St. Louis, where they are sawed into various sizes and shapes and tested in various ways, both "green" and "dry."

This is the most extended and valuable series of physical experiments ever undertaken, and if it can be properly supported it will fix once for all the experimental constants for the different kinds of timber, which will determine both their absolute and relative value.

Your readers are asked to write to Mr. B. E. Fernow, chief Forestry Division of the Agricultural Department, Washington, D. C., asking for copies of such *Bulletins* as have been, or as may be, published on this subject, and, if convinced of its importance, to show their interest by writing *at once* to Hon. Charles H. Page (R. I.),

M. C., chairman, Committee on Manufactures, asking him to have the bill reported, which was referred to their committee at the last session of Congress. This bill is as follows:

A BILL PROVIDING FOR THE EXAMINATION AND TESTING OF AMERICAN TIMBERS.

Whereas there has been inaugurated in the Forestry Division of the Department of Agriculture a comprehensive and elaborate series of tests and examinations of our American timbers, which promises in its results to be of incalculable financial benefit to the country, and,
Whereas, for lack of appropriations, this work cannot be carried on at a rate proportionate to its value and the great benefits to be derived thereby,
Be it enacted by the Senate and House of Representatives in Congress assembled,
That the sum of $40,000 is herewith appropriated to be expended by the Secretary of Agriculture in the Forestry Division exclusively for the work of timber testing and examinations and for the necessary apparatus and other expenses incident thereto; and, further, that $10,000 of this sum or as much of the same as necessary become available at once and before July 1, 1892.

The same bill was introduced into the Senate, and referred to the Committee on Agriculture and Forestry, Hon. Algernon S. Paddock (Neb.), chairman.

By writing to these men, and urging the passage of this bill, your readers would greatly aid in obtaining the necessary legislation to prosecute this investigation with vigor. Up to date active work has been carried on only from July to December, 1891, and from July to December, 1892. It should be made continuous to obtain the best results and in the shortest time. It is the duty of all good citizens to show their interest in such legislation as they think is desirable, and the only effective way to do this is by personal correspondence. Failing in this duty, one must not complain when nothing is done.

J. B. JOHNSON,
Professor Civil Engineering and Director Testing Laboratory.

THE CAISSON FOUNDATIONS OF THE MANHATTAN LIFE INSURANCE BUILDING.

NEW YORK, N. Y., February 8, 1893.

TO THE EDITORS OF THE AMERICAN ARCHITECT:—

Dear Sirs,— Concerning the proposed caisson foundations of the Manhattan Life Insurance Building in this city, since you seem to have considered the matter of sufficient interest to dwell on it in your issue of 4th inst., and indeed to express doubts as to the practicability of the method proposed, and concern as to the difficulties to be encountered, I trust you will permit me, the engineer of the foundations in question, to endeavor to remove the doubts you have expressed, especially as, coming from such a source, those doubts would reflect unfavorably both on the management of this great building and the method itself, which is really the best possible, if not the only one, to employ in this case, where the loads are too great to be carried on piles; while to excavate by any other method to bed-rock thirty feet below the cellar-floor through fine sand and quicksand would permit this to flow and undermine adjacent buildings.

Let me say, first, that the great loads provided for are due, not only to the extreme height of the building, but also to the fact that the architects, Messrs. Kimball & Thompson, have recognized fully and provided for all the possible strains upon the foundations from wind-pressures and the various other sources in, probably, a more thorough way than is generally done. Moreover, they have not been willing to carry these loads down on the outer edge of the foundations, as has so often been the practice in large buildings, but are transferring the loads by means of amply strong cantilevers far enough into the interior of the building to make the centre of weight concentric with the base of each foundation.

The spirit of your remarks seems counter to that approval which your leading journal should surely give to architects who, having to construct one of the modern high office-buildings, are progressive and wise enough to design their work on engineering principles, which, as you must know, have been too frequently neglected in the case of the new style of skeleton construction. This style has brought into play factors and conditions which should be met, from the foundations to the roof, by methods radically different from those previously employed.

But, to meet the specific point which you mention, permit me to ask you to picture one of the proposed caissons as a rectangular box without bottom, about twenty-five feet long, twelve feet wide and eight feet high, placed on the lot when the excavation has been carried about to the water-level. It is built of steel, and stiffened by angles and beams. This box is undermined by men working inside of it, the water being held back by the air-pressure; and there is no possible danger of its ever capsizing or moving laterally. When the cutting-edge reaches the bed-rock, we can, by chiselling or blasting where necessary, cut away the high points until the wall of the caisson touches the bed-rock at the lowest point. Or we may dig down below the wall of the cutting-edge, and build a temporary coffer-dam. The bed-rock can be perfectly cleaned and levelled, or stepped. The concrete filling, about which you express doubts, is done by first covering the entire bottom two or three feet thick, then beginning near the outer edges and building it up in layers of convenient thickness. This concrete can be put in with as much care as can be exercised in the open air, being thoroughly rammed, and it is gotten into place within five minutes after it is mixed. The few inches at the top is rammed in laterally between the roof and the layer previously laid. This work of course begins around the outer edge, the workmen filling-in towards the centre until the space becomes so small that but one man can work. He then completes the work and the shaft is filled after the air-pressure has been taken off. None of the work has to be done by soft grouting.

The process which has been described to you is exactly that which we have employed in many large bridges across the Missouri and Mississippi, and other rivers, and we have just completed a steel caisson, blasting immediately under the cutting-edge, levelling off the rock and filling precisely in the manner described, for a bridge across the Harlem River here.

There is no chance for settlement, and there is no appreciable shrinkage of the concrete. Where the proper preparations are made and energy used, the process will be amply rapid for buildings, as in this case our caissons are ready to bolt together as soon as the lot is excavated. The piers will be built on the caissons as they are undermined, so that the foundations will be finished when the caissons are sunk and filled. The method will surely give a perfect foundation, and it may be of interest to you to know that the cost for foundations of this character is but a small percentage of the entire cost of such a building.

If I am right in supposing that you are mistaken in saying that the process has been used before for the foundations of buildings,— and I know of no such case, — you may feel that the matter is of sufficient interest to excuse this lengthy communication.

Very truly yours, CHARLES SOOYSMITH.

[WE can assure General Sooysmith that we had no intention of reflecting upon any one in connection with the building in question; on the contrary, we approved as cordially as we could do the conscientiousness and care which have led the architects to consider so thoroughly a problem of very unusual character, and to engage to assist them in its solution the coöperation of engineers of the highest skill. As General Sooysmith describes the method to be used, we see no reason why it should not be completely successful. We think, however, that he will agree with us, that it is not one to be handled by amateurs. — EDS. AMERICAN ARCHITECT.]

NEW YORK, N. Y., February 8, 1893.

TO THE EDITORS OF THE AMERICAN ARCHITECT:—

Dear Sirs,— We note the reference you have made in the editorial columns of the *American Architect* of February 4th as to the method to be employed in securing a satisfactory and permanent foundation under the new Manhattan Life Insurance Building to be erected under our direction.

The matter is not new with respect to bridges, but we have never heard of its use for foundations of buildings, and should be pleased to learn where, as you intimate in your notice that it has been used, if you will kindly inform us.

To us who have had this matter under consideration for some months, and have made, and had made by competent engineers, exhaustive calculations bearing on this subject, no insurmountable difficulty is apparent in the sinking of the caissons and securing a solid and well-distributed foundation. The concentrated loads were so great that the methods in common use were inadequate, therefore, when the method adopted was considered, prominent bridge-engineers were consulted, among others Mr. Charles Sooysmith, of Sooysmith & Co., who has had large experience in sinking piers by the pneumatic process, and was selected to direct the work.

We believe this method will meet with favor and come into general use when a foundation such as this is to be successfully carried through.

By the cantilever system employed, we secure full piers for wall-columns with an equal distribution of the load, and not a one-sided affair with a theoretical distribution never attained; and unreliable were the calculated maximum loads ever reached.

We prefer to give such information as may be desired regarding these foundations, as unofficial published reports are not always reliable. Respectfully, KIMBALL & THOMPSON.

[WE shall be very glad to receive information at first hand of the progress of this interesting work. As we often have occasion to say, we are generally obliged to depend for early intelligence of matters of the sort on the daily papers, and, while we would like to get exact details from the persons best able to give them, it is not often possible to wait for them. As to the buildings which have been previously constructed with the help of caissons, we, of course, only referred to caissons of the ordinary sort, which have been used for a half-century, at least. So far as we know, the pneumatic modification and the filling of the caisson with concrete from the inside are entirely new, in their application to buildings. — EDS. AMERICAN ARCHITECT.]

MODERN SEPULTURE.

BOSTON, MASS.

TO THE EDITORS OF THE AMERICAN ARCHITECT:—

Dear Sirs,— In your issue of January 14, 1893, there was an account of people being buried beneath churches. Recently, when about to pass the graveyard on Boston Common, I saw some men at work opening a tomb under the walk from Park Street Church to Park Square. I went into the graveyard, and I saw a sight that I did not suppose existed in the State of Massachusetts. Wooden coffins without boxes, some of grown people and some of infants, all

in a heap: some were broken open, from their decay, and the contents were protruding in an indiscriminate manner. I was informed that the last interment was made in 1885, and another was to be made that day. The top of the last coffin must have come within three feet of the surface of the earth. Is not Boston preparing for a pestilence? Yours respectfully, Aurin F. Hill.

[The man who properly respects his nerves and stomach will refrain from allowing his curiosity to carry him into the dissecting-room, charnel-house, catacomb, burning ghaut or other place where poor humanity is dissolved into its primal elements. Such communications as this may do good in reminding people that cremation offers a more civilized method of disposing of the dead than does inhumation or intra-mural sepulture. — Eds. American Architect.]

Notes and Clippings

Modern Church-building in England. — A Parliamentary Return which has just been issued in England shows the number of churches (including cathedrals) in every diocese in England which have been built or restored, at a cost exceeding £500, since the year 1873. The Return also shows, in each case, as far as possible, the amount expended and the sources from which the required funds were derived. The period covered extends from 1873 to 1891, or about eighteen years, and the total amount spent reaches the vast total of £20,531,403. Of this sum £9,607,783 were devoted to the building of churches, and £10,609,628 to the work of restoration, while the sum of £313,992 was expended for kindred purposes. Concerning the sources of these great sums, church-rates and parish-rates are sometimes mentioned for small amounts, but by far the greater part was derived from private subscription. Thus, in the case of the Diocese of Canterbury, the total expenditure (exclusive of £35,127 for the cathedral, of which £10,773 proceeded from private benefactions, and the remainder from church-funds) amounted to £672,012, towards which church-rates furnished £1,824; church-funds, £8,127; church-building societies, £16,502; and ecclesiastical commissioners, £12,563; these amounts making £39,016; while the remainder, £632,996, proceeded entirely from private sources. The Diocese of London led in the expenditure for church-building, the amount being very little less than £1,189,000. For church-restoration there was an outlay of £820,329, the total exceeding £2,000,000. The restoration of St. Paul's Cathedral cost £126,000, half of which was paid by voluntary contributions. In several cases churches costing from £30,000 to £40,000 were entirely paid for by their own congregations. — *New York Evening Post.*

Smokeless Combustion in Germany. — The problem of the smokeless combustion of coal is said to have been solved by an invention which has just been patented in Berlin, and which is thus described by a German correspondent of a London newspaper: "At the furnace door there is a movable pear-shaped apparatus, consisting principally of a fire-chamber lined with fire-brick. One aperture of this hollow pear opens, in the direction of the axis of the boiler, into the mouth of the hitherto employed furnace, from which the fire-grates, fire-bridges, etc., have been removed. The opposite aperture of the hollow pear is intended to admit a current of air. By means of an ingenious automatic contrivance, coal-dust, supplied through a funnel placed above the current of air, is continually conveyed into the current of air, and thence into the fire-chamber, where it is immediately brought into combustion by means of the small fire which is placed there. When this has once taken place, the coal dust conveyed by the current of air continues to burn in one regular, intense flame. The current of air which brings the coal-dust into the apparatus is regulated so as merely to convey the dust thither, whereas the further supply of air necessary for a combustion is sent into the zone of combustion at right angles and in radiating jets. By this arrangement the coal-dust and the air in the zone of combustion are intimately and thoroughly mixed, while the speed of the current which introduces the coal-dust is diminished. It will thus be seen that the combustion of the coal which this method produces is extremely thorough, for each particle of fuel floats in the air and is brought into contact with the oxygen necessary for its combustion, so that it is totally consumed the moment it enters the sphere of combustion. The proof of its being totally consumed is seen in the fact that not even a trace of smoke is perceptible."

The Garden of the Taj. — The Taj at Agra is a building unique among the trophies of human art, in so far that it commands admiration from every beholder, European or Asiatic, young or old, cultured or Philistine. Any interference with such a monument is regarded with jealous alarm by men of taste the world over. We read in the Kew *Bulletin* that the famous garden surrounding it has been subjected to omnious reports and memoranda lately. Those favored souls who can consult their memory are apt to declare that the garden they recall could not be bettered. Those who know it only by photographs entertain the same belief, probably. But landscape-gardeners and others on the spot, permeated with the superior taste of Europe, see lots of room for improvement. They have already cut down "nearly all the lofty trees, principally *mimusops*, forming the main avenue from gate to tomb." They pronounce "the existing medley of shrubs on either side of the canal unsightly." They would like some cheerful carpet-bedding and some winding walks. Happily, the Government of India is an intelligent despotism, and even gardeners cannot carry through their schemes without reference to higher authority. The Lieutenant-Governor himself paid a visit, to judge with his own eyes, and most of these scientific projects are dismissed. The lofty trees cannot be restored, but others are to be planted; yet we observe that *Eucalyptus globulus*, an Australian tree, is not positively forbidden in the gardens of the Taj. So the carpet-bedding and the winding walks are negatived; but "geometrical scrolled beds on each side of the water, with a line of *cycads*," find approval. The Lieutenant-Governor may be unaware that *cycads*, unsuitable in themselves, come from New Zealand — the species, that is, which is probably chosen. Other "improvements" also are passed. Could not his Excellency find courage to declare that the gardens of the Taj are sacrosanct, and forbid any meddling at all? — *London Standard.*

A Millennial Labor-union. — A remarkable labor-union must be the Boilermakers' and Iron and Steel Ship-builders' Society of Great Britain, according to the testimony of its secretary before Lord Salisbury's Labor Commission. Its membership embraces about ninety-five per cent of all the workingmen engaged in the trades represented in the union, and it has an excellent record for peaceful settlement of disputes with employers. For the past eleven years it has spent only a little more than three per cent of its income in support of strikes, and has adopted the sensible principle of having its men keep on at work pending the settlement of any controversy over wages. It is said that sometimes a vessel is actually finished and at sea before the price paid for putting on her plates has been finally determined. What is still more remarkable, the union undertakes to be pecuniarily responsible for the good faith and good workmanship of its members. Thus, when ten men working on a vessel at Hartlepool, the contract for which called for speedy delivery, struck for higher wages, contrary to agreement, the union made good the difference to the firm and compelled the strikers to refund the money. So when contracts are left unfinished or work is botched, the union stands ready to make good the losses caused by dishonest or inefficient members, and looks to the offenders for reimbursement. If all unions went on such principles, it would make the millennium seem nigh at hand. — *N. Y. Evening Post.*

Robbing Corner-stones. — It has been discovered that a corner-stone under a noted market-place in Mexico City, built some fifty years ago, has been recently robbed. The thieves got several dollars' worth of gold and silver which had been buried in the stone. We know of another case in Mexico, where a corner-stone of a foundation was robbed the night after it had been formally "laid" and a list of its contents, including some current coins of small value, had been read out as part of the ceremony. But this is the first instance brought to our notice of the robbery of a corner-stone of such ancient date, even in Mexico, and suggests that some precaution will have to be taken in future against this form of robbery.

Trade Surveys

All commercial, industrial, financial and railroad reports agree in this, that a large volume of business is being done. Another fact apparent is, that business is active in all parts of the country, except where weather prevents. A third favorable fact noticed is, that preparations are being actively made for a busier year than last among builders, engineers, architects and contractors. The information on this point is not quite thorough enough to warrant a cast-iron deduction, but the probabilities point to a busier building year than last. Brick is quoted higher than last autumn in several cities, and stocks are light. Large contracts, extending over the season, have been already made by large builders, and makers of brick have within two weeks declined to make further contracts at similar figures. Lumber is also declared to be stronger and relatively scarcer, but whether this is a dealers' scare or not it is impossible to say. Certain it is that the market is short several hundred feet of what it was at this time last year, and the trade-reports of all reliable lumber papers breathe a stronger tone than even thirty days ago. Special advices from several Southern points also show a bolder feeling among the hard-wood manufacturers over the satisfactory winter distribution of stocks. Then it is learned that Southern mills have not been crowded so energetically as last year, and that there is less amount of ready lumber for sale. A somewhat similar course has been pursued by some other makers of building material, so that the shrewder among the builders have deemed it wise lately to extend their contracts for material a little further. This action, as above mentioned, has attracted the attention of manufacturers, with what result remains to be seen. The iron trade is quite active. Large contracts for material have been placed within a few days. Turning to textile interests, it is observed that large purchases of wool have been made; that large contracts for the supply of yarn have been entered into; that a generous distribution of goods, including hosiery and cloth goods, has been made; that orders are crowding in; that stocks of cotton goods are exceptionally light, and that mills generally are running full time. Looking at Boston, New York and Philadelphia jobbing centres, the fact is quite apparent, and is made more prominent by statistics of rail shipments of freight, that a big business for mid-winter is being done in all the leading lines of staple goods. Several authorities say the reason is that retailers recognize that goods are at rock-bottom, and that it is advisable to carry larger stocks. If this is the correct opinion, it means that the jobbers will do a larger business during the next ninety days than they have done during the same time for some years; but the inference is scarcely warranted at present. It has been said before, and is here reiterated, that the strongest feature of the whole business situation is the moderate amount of merchandise, stocks, wares and material in the hands of middle-men, store-keepers or intermediates, by whatever name known. This fact may prove to be a sad one to many and a happy one to many more, according as it strikes them. It is hardly possible that the business interests of the country have been making, or are making, the mistake of manufacturing too little and carrying too little stocks. The probabilities are that business interests are occupying conservative grounds, and are doing what should have been done years ago. There is no increase in commercial failures, no weakening of confidence, no hesitancy among the promoters and pushers who make new business. All conditions are favorable, notwithstanding the newspaper lamentations over strike possibilities, gold-bond evils, silver troubles and all the rest. The narrowness of margins must be borne with: there is no artificial or legislative remedy for it, and no real harm can ever come to business interests from it.

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CONTENTS

SUMMARY: —
The Universal Mercantile Schedule adopted by some Insurance Companies. — The Failure of an earlier similar Schedule — The Inadequancy of the Rebate for a Waterproof Floor. — The Refusal of the Statue of President Arthur by the Park Commissioners of New York — American *vs.* Foreign Marbles — The Government-Building Bill. — The Memorial Association of the District of Columbia. 113
THE LANGUEDOCIAN SCHOOL OF ARCHITECTURE. — II. 115
OFFICE-HELP FOR ARCHITECTS. — VII. 117
TOWN-GATES IN SOUTHERN GERMANY. 119
COMPARATIVE MUNICIPAL BUILDING LAWS. — XXII. 122
THE MARCH OF ANCONA. 123
BOOKS AND PAPERS. 124
SOCIETIES. 125
ILLUSTRATIONS: —
Houses on North State St., Chicago, Ill. — Sketch for a Country House. — House at St. Louis, Mo. — House at Wellesley Hills, Mass. — Stable and Ambulance-station for the City Hospital, Boston, Mass. — House at New York, N. Y.
Additional: Ossuary at Sizun, Finisterre, France. — Church of St. Thegonnec, Finisterre, France. — Interior View of the Church of the Rosary, Lourdes, France. — Lateral View showing Approaches of the Same. — The Basilica and General View of the Same. — "The Fall of Babylon." — Backford Church Reredos. — "The Seasons." — West End Branch, Credit Lyonnais, Cockspur Street, London, S. W., Eng. — The Cathedral, Mayence, Germany. — New Premises, Lloyds Bank, Limited, Bexhill-on-Sea, Eng. 126
COMMUNICATIONS: —
Cellar or No Cellar? — One Club and Three Architects. . . 127
NOTES AND CLIPPINGS. 128

MR. F. C. MOORE, the distinguished president of the Continental Insurance Company of New York, whose useful little pamphlet of suggestions for improved building, from the underwriters' point-of-view, is probably familiar to our readers, sends us, as a sort of answer to our comments on the recent great fire in Boston, a copy of the new Mercantile Schedule, for the rating of buildings for insurance in reasonable accordance with the risk, which has been prepared by a committee of underwriters, mainly, we imagine, under the lead and direction of Mr. Moore himself. It need hardly be said that the schedule is an excellent one. The idea is the same as that in accordance with which the New York insurance companies, several years ago, agreed upon a standard premium rate, and a schedule of deductions which should be made in cases where certain safeguards were provided, but it is carried, in the present case, into far greater detail. The New York agreement, as we know, had a very great influence upon the construction of mercantile buildings while it remained in operation, and there is no question that the present schedule would exert a similar influence if it should be generally adopted. It is, however, one thing to lay down judicious principles of insurance, and another to have them carried out by the companies, and, unless they are faithfully carried out, they might as well not exist, so far as effect on building is concerned. In the case of the agreement of the New York underwriters, an officer was appointed by the companies, whose business it was to examine plans of new buildings, fix the rates which would be charged, and offer suggestions, by following which the rates might be reduced, and our experience, like that, we presume, of other architects, was that the owners of the intended structure, on hearing his suggestions, immediately calculated whether the saving in insurance would be equal to interest on the cost of the proposed improvements, and, if they found that it would be, promptly ordered the change to be made.

AFTER a time, however, the Underwriters' Association fell to pieces, from causes which the insurance companies do not care to discuss, but which the outside world imagines to have consisted principally in secret underselling of each other by the members. With the collapse of the Association, the rating schedule disappeared, and owners, finding that rates were determined by the energy of brokers, and not by considerations of construction, naturally left out every expense, in the way of precaution against fire, on which they could not save a fair interest in premium rates. In the case of the present schedule, if it should be generally adopted by the insurance companies, which does not appear to be yet the case, it would have to be maintained for several years before it could exercise any appreciable effect on the habits of construction of an entire city, and such maintenance we believe to be impossible. Until the insurance business is carried on under very different methods from those now prevalent, a man who has a million dollars of insurance to place, say on a stock of dry-goods, will inevitably have favors shown him, in the shape of relaxation of the rules, which will not be accorded under exactly similar circumstances to a man who wants policies for only five or ten thousand dollars; yet every one knows that the risk is proportionately much greater on the larger stock; and as the large dealer is sure to boast of the favorable rate given him, the other companies hear of it, and on the next occasion "meet" it with a still better one, until the schedule is totally neglected, and the underwriters, when the buildings, cheaply built, and still more cheaply insured, begin to burn down, are reduced to belaboring the architects as the cause of all their woes.

HOWEVER, we will not continue these gloomy prophecies, but will turn for a moment to the Standard Schedule itself. Excellent as it is, we cannot help thinking that the advice of an architect would have been of use to the committee which prepared it, not only for making new suggestions, but for criticising those made by others. For example, we find that two per cent is deducted from the standard rates where waterproof paper is laid between the upper and under flooring, while only five per cent is deducted for a floor really waterproof, inclined so as to throw off water, and provided with scuppers and waste-pipes to carry water falling on the floor immediately to the sewer. To this description should have been added a stipulation that the walls should be flashed eight or ten inches high, but this is virtually included in the idea of a waterproof floor. Now, it is, we believe, found that in city fires the damage done to stock by water is at least twice as great as that done by fire and smoke, so that a really waterproof floor is of immense value in saving goods from injury, while a floor simply laid with waterproof paper is almost valueless, for the reason that in such a floor the paper is pierced with from six to twelve nail-holes in every square foot, or twelve to twenty-four thousand in each floor of an ordinary building. As the water from the engines often stands several inches deep on the floor of a building at a fire, it would, of course, pour in showers through such "waterproofing," while a properly constructed waterproof floor, with a sufficiency of pipes and scuppers, would not let a single drop through; yet, on a premium rate of a thousand dollars a year, the deduction for such construction would be only fifty dollars, which would not be anything like the interest on its cost, while the deduction of twenty dollars for the mere sham of waterproof paper would be sufficient to secure its use in all new constructions where the building-laws would permit it.

SOON after the death of the late President Arthur an association was formed among his friends in New York to raise funds for erecting a statue of him in the city. The money was raised and an Executive Committee of the subscribers appointed to take charge of the work. Mr. Ephraim Keyser, whose name is probably familiar to our readers, and who was the sculptor of the colossal broze angel on President Arthur's monument at Albany, and of the De Kalb statue at Annapolis, was selected by the Executive Committee as the sculptor of the new statue, and made several sketches, one of which was approved, and a model made, nine feet high, which was cast in bronze at the Henry Bonnard foundry. It was intended by the subscribers that the statue should be erected in the Plaza Circle, at the crossing of Fifth Avenue and Fifty-ninth Street, and the monument was designed with reference to this conspicuous situation, the statue being intended to stand over the centre of a sort of semicircular *exèdre*, at the ends of which were to be life-size female figures carrying lamps in their hands. On the completion of the statue, application was made to the Park Commissioners for permission to erect it in

the place intended. The Park Commissioners referred the matter to their Art Committee, which consists of Messrs. Henry G. Marquand, Thomas W. Woods, the president of the National Academy of Design, and Napoleon Le Brun, the president of the New York Chapter of the American Institute of Architects. This committee went to see the statue at the foundry, and reported to the Park Commissioners that it was, in their opinion, "not equal to the average of the sculpture in the Park"; and they declined to recommend it to the Commissioners for acceptance. In consequence of this report, the Park Commissioners refused to accept the statue; or, according to one account, suspended definite action until the parties interested had been notified of the opinion of the Art Committee.

NATURALLY, the Executive Committee of the Monument Association, and their sculptor, were somewhat disagreeably surprised at this result of their labors. Mr. Keyser seems to have received the intelligence philosophically, observing that if his statue was worse than the average of the Park sculpture, it must be pretty bad, which is certainly true; while the Executive Committee, acknowledging that they were not experts in such matters, thought that the figure was an excellent likeness, and had approved it on that account. What will be the end of the affair no one has ventured to predict. It is said that the Park Commissioners have seriously considered the advisability of collecting the worst of the rubbish among the Park sculpture, and sending it to adorn the Mott-Haven pleasure-grounds, and, while we fully agree with the care which would reserve the Plaza Circle, which will soon be the most conspicuous site for a monument in the whole city, for something worthy of it, there appears to be no reason why the Arthur monument might not be for many years the ornament and pride of a square in the annexed wards. In fact, it seems to us that it might be possible to raise the standard of sculpture in the city effectively, as well as considerately, by dividing the sites suitable for monuments into several different grades, and assigning, under the advice of the Art Committee, a position of a certain grade to any decent statue offered to the municipality. The emulation of sculptors and committees would then be excited to win assignments to the higher grades, and there would be no need of absolute rejection, with its inevitable accompaniment of a long list of disappointed subscribers with a couple of tons of old junk left on their hands, and a sculptor, deprived at a blow of his reputation and his living, "*pour encourager les autres.*"

THE marble-workers of Tennessee, Georgia and Vermont are rather indignant over the selection of Italian and other foreign marbles for the interior decoration of the new Congressional Library Building at Washington. Vermont marble to the value of about thirty thousand dollars has been contracted for, with about three thousand dollars' worth from Tennessee and five thousand dollars' worth from Georgia; but three hundred and twenty-five thousand dollars' worth has been ordered from Italy, and two hundred and seventy-five thousand dollars' worth from other foreign countries, and the Tennessee and Georgia and Vermont men claim that they could have furnished marble just as good as the foreign, and at a lower price, and they and certain newspapers protest that an unjust discrimination has been used against them.

AS this is a matter about which architects know a good deal more than the newspapers, we may say at once that if Vermont, Tennessee and Georgia can produce marbles which will compare favorably for architectural decoration with those from Italy, France, Belgium, Greece and Northern Africa, and at as low a price, architects have not yet learned the fact. That there is plenty of marble in Georgia and elsewhere which is persistently asserted to be equal or superior to the foreign stone is perfectly true; but if there is really any marble in any State in the Union which is as beautiful in color, as smooth, close-grained and even in texture, and as easily worked into large, thin sheets, as many of the foreign marbles, we have yet to see it,—and we have been looking out for a really first-class American marble for a good many years. There is a pink Georgia marble in the market, which is of a pretty color, but has a sandy, disagreeable effect in large surfaces. We have also specimens of a blue-veined Georgia marble with the same defect, and there are various white marbles from Georgia, coarsely crystallized for the most part, and therefore undesirable for interior finish, whatever the dealers in them may say. Vermont has a most beautiful white marble, with a peculiar waxy translucency, but it is soft, and is soon ruined by stains, where the white Italian would retain its purity; and it has another grave defect, in the shape of hard particles, which do not polish down like the rest, and spoil the appearance of the surface; and there is another Vermont veined white marble, sometimes palmed off by country plumbers in place of the Italian, which has a dingy, greenish effect. So far as we know, the best American marble yet brought into the market for interior decoration is the Knoxville "dove-colored" variety, and although its color is not particularly attractive, the immense demand for it shows that a really good American stone, which can be furnished as it is wanted, is sure to make for itself a good market. We have no desire to disparage American marbles; on the contrary, we have seen many small samples of great promise, which, however, have never really come into the market, and there may be others of merit which we do not know; but, in general, the producers of American finishing marbles seem to prefer to spend their time and money in advertising, and in trying to persuade architects that their stone is what it is not, to using it really to develop their quarries. As a rule, the stone in quarries improves in quality with the depth, and, unless our country is extraordinarily favored, a great deal of money must be spent in the marble States before their quarries are likely to compete with those which were hunted out two thousand years ago by the best judges of marble that ever lived, and have been worked ever since in the most skilful and thorough manner known to science.

THE Tarsney bill, providing that the public building work shall be intrusted to private architects, under certain restrictions, which has already passed the House of Representatives, has passed the Senate, but with an amendment, providing that, in case of competition for designs, only the successful architect shall be paid for his drawings. In consequence of this amendment, which does not seem to have been extremely necessary, the bill must go back to a conference committee, in order that a compromise measure may be drawn up which will pass both Houses in the same form. After this is done the bill as so passed will be ready for the President's signature. The passage of the bill, in nearly the same form, by both Houses, shows conclusively that the temper of Congress is favorable to the excellent measure proposed, and it is much to be hoped that the matter may be adjusted, and the law definitely placed on the statute-book before the final adjournment of the present Congress, which would earn for itself the lasting gratitude of every one interested in the artistic advancement of the United States by being the first to take the public architecture out of the Government plan-factory and commit it to the best professional men in the country.

IT is very satisfactory to learn that a "Memorial Association of the District of Columbia" has been formed, which has for its object the preservation of objects of historical interest in and about the city of Washington, and the proper marking of them, together with the dissemination of information in regard to them. The anomalous political condition of the District of Columbia, with the very shifting character of its population, have worked together to check civic feeling in what seems to strangers historically the most interesting city in the United States. To the New Englander, or the Southern or Western man, to say nothing of the English cousins whose admiration for some of our great men quite equals our own, Ford's Theatre, — so long as it existed, — the waiting-room in the Baltimore and Potomac station, the Tenth Street house where Lincoln died, the Arlington mansion, the Soldiers' Home, the Blaine house, and, of course, Mount Vernon, have always been objects of great attraction, and there are many more which would be so if they were properly designated, as is proposed by the Association. Chief Justice Fuller is the president of the Association, and Mr. Myron M. Parker is secretary. Congress, which is usually liberal to the District, will be asked to provide what funds are necessary, and the officers of the Association furnish gratuitously the care and study required for carrying out its objects.

THE LANGUEDOCIAN SCHOOL OF ARCHITECTURE.[1] — II.

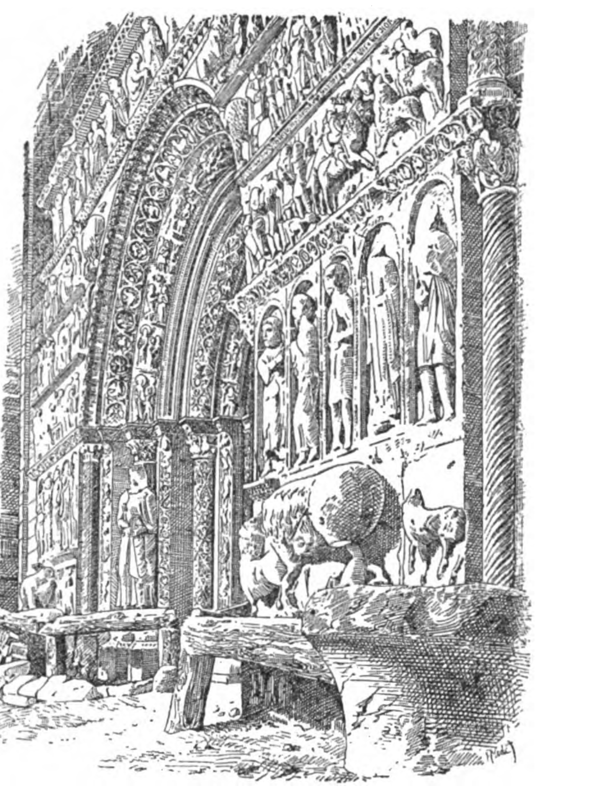


Fig. 4. Portal at Ripoll (Catalonia), after a photograph by Franz Schrader.

THOUGH the Languedocian Romanesque school may be the poorest in belfries, it is, on the other hand, one of the richest as regards sculptures; the school of sculpture cradled at Toulouse was indeed the most powerful in the Occident prior to the Pointed period. M. Benezet, in his history of the art of Toulouse, published in 1887 in the beautiful work entitled "*Toulouse*" (pp. 493–596), gives an excellent summary of its peculiar characteristics:

"The vast number of monuments that sprang up suddenly and as though spontaneouly on southern soil, at the time of the Crusades, bear witness in their statuary to the simultaneous existence and activity of local schools, distinct in principle and manner, but united, as it were, in the common determination to resist Byzantine influence. National and individual rivalry animates the artists.

"The school of ancient traditions is recognizable by the somewhat superannuated and conventional majesty of its creations. The figures, with square heads, shaven hair and beatific expression, of the Twelve Apostles in the cloister of Moissac and the porch of Beaulieu (Corrèze) belong to it.

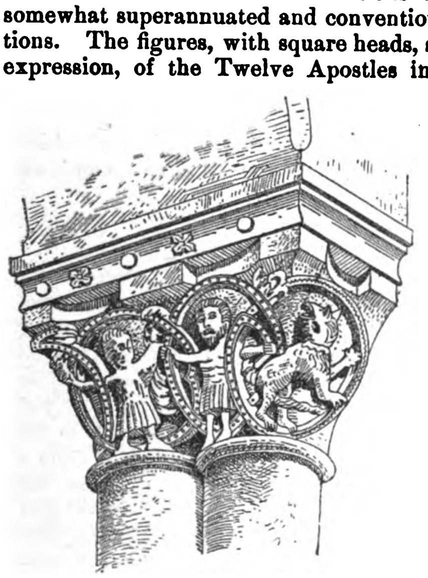


Fig. 5. Geminate Capital, at Saint-Lizier.

"Features of an opposite cast, curiously restless, feverish and anxious in expression, distinguish the productions of the Visigothic school. This school is perhaps best represented, with all its movement and passion, in the bas-reliefs of the figures of St. Peter and St. Paul at the entrance of the church of Moissac, and in those of the Zodiac coming from Saint-Servin, at Toulouse.

"Dreamy and pretentious at the same time, elegant and melancholy, the Frankish school, in its turn, produced in the twelfth century works of exceptional merit, in which an attempt to copy nature may be noted; as examples, we call attention to the mild-eyed, long-haired figures adorning the porches of the cloisters of St. Stephen and of Notre-Dame-de-la-Daurade, at Toulouse."

The Languedocian architects early began to decorate their doorways with statues; at first these were mere effigies in round-relief, cut in shallow niches on the flat surface of the mass out of which the door was, as it were, hollowed. The doorway of the church of Ripoll (Fig. 4), in Catalonia, is sumptuously ornamented with several rows of these figures, which, gradually becoming disengaged, took their places in the embrasures against the columns, performing the functions of caryatides. The capital above is nearly always storied and depicts scenes in the life of the person represented by the statue.

Fig. 6. Portal at Valcabrère.

The storied capital was the favorite type for portals and cloisters; in the windows and interior arcades it was often replaced by a capital embellished with plaited or interlacing patterns or with foliage; or by a mixed capital with figures of persons and animals framed-in by beaded cordons (Fig. 5), palmettes or scrollwork. The first two have a rather graceless curve; the one with foliage enrichments is more elegant, but is sometimes chiselled with a certain stiffness, as, for example, at St. Servin and in two other churches of the same school, those of Saint-Gaudens and Unac. The abacus is generally decorated with palmettes and foliage.

Round mouldings predominate, from the close of the eleventh century, in the archivolts, which are ornamented besides with checker-board, billet and cable mouldings, with projecting heads, and in the framing arches more especially, as in the imposts and cornices, with palmettes and foliage.

The portals are remarkable, though possessing no peculiar characteristics of beauty, aside from those with statues (Fig. 6). The Languedocian architects did not succeed in giving their sculpture a masterly and monumental setting; they allowed their neighbors of Limousin and Provence to win this honor away from them. The celebrated portal of St. Peter's at Moissac, although within the limits of the Languedocian school, belongs to Limousin. The cloister at Moissac, one of the most beautiful in France, is, however, Languedocian: it was erected in 1100, under Abbot Anquetil (Fig. 7).

The Languedocian school is one of the richest in France in mediæval cloisters. After the cloister of Moissac should also be noted, the Romanesque cloisters of Elne, of Saint-Lizier, of Saint-Bertrand-de-Comminges, of Saint-Salvi at Albi (in part) and of Saint-Michel at Grandmont, near Lodève. The arches are not geminate, but are all uniform and supported by colonnettes grouped in twos, ranged depthwise, with capitals united by a single abacus; in case of rather long galleries the colonnettes are disposed at intervals in groups of four, or they are replaced by a square pier or pillar. At Moissac, the arcades are in broken arches. This form, which was adopted at about the same time for the huge tunnel-vault of Saint-Nazaire at Carcassonne, had made some slight progress before the end of the twelfth century; but thereafter it was in general use, while the storied capital maintained its place until the fifteenth century (portals of the churches of Rabastens-sur-Tarn and of Montjoie, fourteenth century; cloisters of Marciac and of Saint-Sever-de-Rustan, fifteenth century; there are also interesting

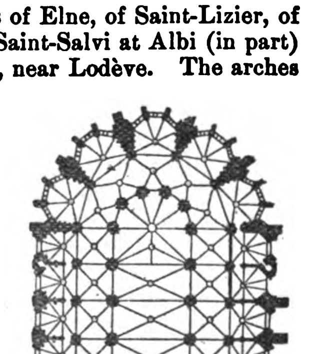


Fig. 8. Cathedral of Narbonne.

[1] From the French of Anthyme Saint-Paul, in Planat's *Encyclopédie de l'Architecture et de la Construction*. Continued from No. 895, page 100.

specimens in the museums of Toulouse, Tarbes and Carcassonne); the foliage enrichments continued to be employed until the middle of the fourteenth century at least (the same church of Rabastens, house in the Rue Croix-Baragnon, at Toulouse, etc.). Nevertheless, Romanesque traditions had a hard life; they appear at the height of the Renaissance period, in certain doorways in regions about the Pyrenees which at a distance look like rough imitations of semicircular doorways with eleventh-century tympanums.

The nave of the abbey-church of Bonnefont (Haute-Garonne), erected about 1150, which the author of this sketch saw in 1856, before its huge vaults were destroyed, is probably the oldest edifice in which ribbing was systematically applied; it is true that the Cistercian monks who built it were from the diocese of Langres.

A more finished and more imposing application of the system is exhibited in the nave of the cathedral of St. Stephen, at Toulouse; this nave is more than sixty feet broad in the clear, and is covered with three enormous ribbed vaults borne on clusters of four columns in strong projection on the walls. This prominence is in no way due to an imitation of Provençal churches with interior buttresses, but results from the necessity of diminishing the unusual bearing of the vaults, while at the same time preserving the lateral walls of the original three-aisled cathedral. St. Stephen's was probably not the first large edifice to be constructed without side-aisles. In addition to the three churches cited above for their machicolations, we find single naves in the cathedral of Saint-Lizier and at the abbey of Saint-Savin at Lavedan, both of which are about a quarter of a century older than the vaults of St. Stephen; the latter were executed in 1211, at the time of the first siege of the city by Simon de Montfort.

Broad and lofty single naves without transepts, together with the strategical features of the belfry and of certain other dispositions, constitute the special characteristics of Languedocian architecture during the Pointed period.

All of the churches with side-aisles come from a direct importation of northern architecture; for example: Saint-Paul-Serge at Narbonne, whose choir with *chevet*, built about 1230, bears evidence of Norman influences, awkwardly interpreted; the abbey-church of Valmagne, middle of the thirteenth century; the cathedrals of Narbonne (Fig. 8) and of Toulouse, the choirs of which were begun in 1272; the cathedral of Rodez, built between 1277 and the middle of the sixteenth century; Saint-Martin at Limoux, belonging to the fourteenth and fifteenth centuries; the cathedral of Mende, of the fourteenth century, which is a sort of compromise between the architecture of the south and that of the north; the cathedral of Auch, begun in 1483; to these must be added the choir of Sainte-Marie-d'Oloron, a squat construction of the fourteenth century, which unquestionably was not completed in accordance with the original plan. In the cathedrals of Elne and Alet, the foundations of choirs with radiating chapels were laid, in the fifteenth century, behind the Romanesque apses; but in view of the rudimentary state in which the work was left, it is impossible to determine whether there were to have been side-aisles or not. The choir and the transept of Saint-Nazaire at Carcassonne, built in the first quarter of the fourteenth century, are unique constructions, the plan of which belongs neither to the north or the south; but the exceptional grace of the style is northern.

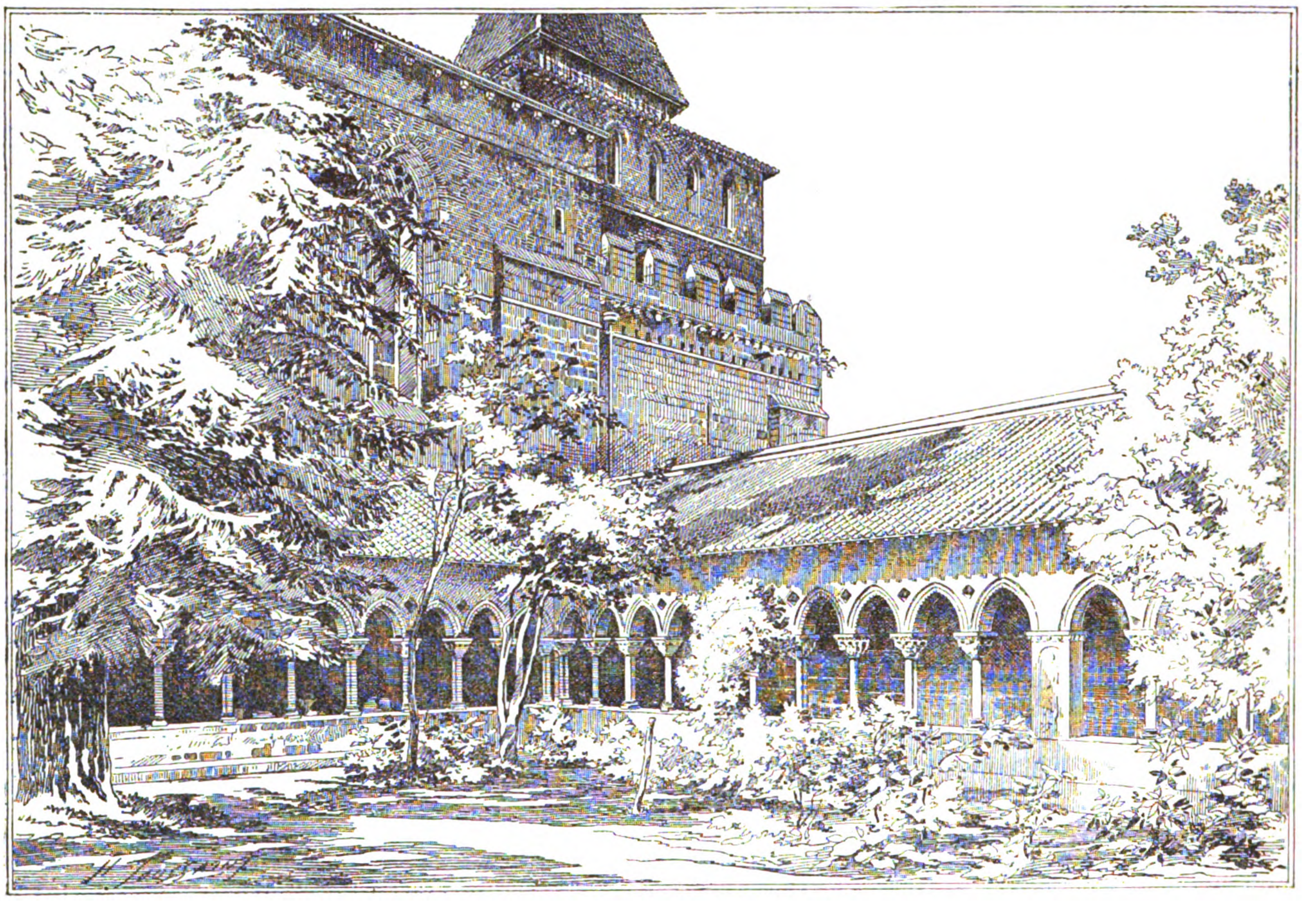


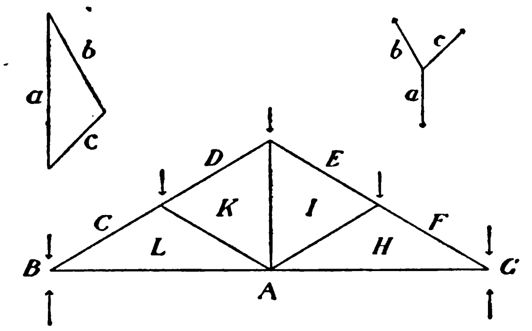
Fig. 7. Cloisters at Moissac.

[To be continued.]

The Destructive White Ants. — A fortune lies in store for the man who will discover some process for cheaply making wood proof against white ants. These pests are the curse of existence in Amoy and every other tropical or sub-tropical city. Their voracity is incredible. They ate the framework of a new door in my consulate in three weeks. In the same period they almost consumed a large and handsome cabinet in the court-room, and a heavy pine settee in the ante-room. Their work is invisible. They attack the wood from a mere point, through which they bore to the interior, and there eat everything until only a shell or film remains. Wood which will successfully resist these insect pests must be thoroughly charged with some powerful chemical, both poisonous and non-evaporable. A solution of corrosive sublimate, chloride of zinc, arsenic, or antimony would seem to meet the want; but how to force these into the fibres until the latter are saturated, and to do so at a merely fractional cost of the wood itself, is the problem that confronts the inventor. The American genius is so prolific in invention and discovery that I feel assured the problem will be satisfactorily solved before the end of this decade. — *Puget Sound Lumberman.*

OFFICE-HELP FOR ARCHITECTS.[1]—VII.

SECTION III.—FRAMES:



Figs. 22 and 23.

§ 176. Method: — Usually the readiest method of ascertaining the strain in any frame is by the graphic method. In this the direction and intensity of a strain is represented by a line. The underlying principle is, that if three or more forces be in equilibrium about a point, their direction and intensity will be proportioned to the sides of a polygon drawn parallel to these forces (Fig. 22).

In all frames, for stability it is necessary that the forces should all be in equilibrium, and to obtain this the frames are so designed that the only external forces needed for equilibrium are the reactions of the points of support.

Notation: — Letter the spaces on both inside and outside of frame with capital letters; letter the strain-diagram with corresponding small letters (Fig. 23), then any combination of two capital letters will represent either the piece included between them, as *C, L* represents the piece which comes between *C* and *L*; or the force acting on the joint, as *C, D* represents the force on the joint at this point.

§ 177. Procedure: — The general procedure is to lay out the frame in skeleton, with horizontal members horizontal, to a $\frac{1}{2}''$ or $\frac{3}{4}''$ scale. Then plot the successive loads from one abutment or point of support to the other in a vertical line below the truss, scaling the loads to any convenient scale — some multiple of 12 is best — in pounds per inch; thus if we take 4,800 pounds per inch, the $\frac{1}{4}''$ scale will read to 100 pounds in sub-division of inches, and each foot scaled will = 1,200 pounds. If we take 2,400 pounds the same will be true of the $\frac{1}{2}''$ scale, 1,600 pounds per inch will enable us to scale 100 pounds per inch in the $\frac{3}{4}''$ scale, and 1,200 pounds per foot = 1,200 pounds per inch similarly enables us to use the inch-scale, and since we can scale then to $\frac{1}{4}''$ or 25 pounds, we need not use any larger one. Generally a scale that will enable us to read to the nearest 100 pounds is close enough.

The effect of the load should always be concentrated at the joints when possible, and every portion of the load should be accounted for in the load-line. The load-line between its extremities represents the load on the rafter, and loads on the chords are plotted within the line (see § 178). Referring to Figure 24 and its load-line, notice that $e\,d$ represents the half load on the rafter $F\,D$, then that $d\,c = d\,a + a\,c$ or the sum of the half-loads on the rafters $F\,D$ and $F\,C$ and that $c\,b =$ the half-load on the rafter $C\,F$. Furthermore $e\,d$ and $c\,b$ are borne directly by the abutments and therefore exert no stress on the rafter and might be neglected were it not that we ought to be able to account for all of the load. If the loading is symmetrical so that the reaction of each of the abutments $= \frac{1}{2}$ total load, very good. If not, the reaction must be ascertained for each abutment (see § 175).

We must also remember that every truss of metal must be fixed at one end and be left free to expand and contract at the other, and, finally, that the wind will act on both sides of the truss. We must therefore include in our static loads all roof-boarding, trusses, purlins, rafters and often ceilings, etc., and then ascertain the wind-effect, and in the following diagrams we have first the strain-diagram due to static load (*S. L.*), then that due to wind from the left (*W. L.*) and then that due to wind from the right (*W. R.*); the left-hand end of the truss in all cases being assumed as fixed and the right-hand end as movable.

To determine the character of the strain in any piece: Begin in the strain-diagram by passing down the load-line in the direction in which the load acts, and then pass on around the polygon of strains at that joint taking up the pieces in the order in which they occur when going around from left to right, the direction in which the lines are drawn showing the direction in which the stress acts on the joint. Compression strains must be marked + on the diagrams and tensile strains marked —.

Loads will be designated ↑, the arrow showing direction; loads of changeable direction and reactions thus ↓.

§ 178. Truss I: (Fig. 24) *Static-Load Diagram:* — Load-line: — Assume weight of roof on rafter $D\,F$ concentrated $\frac{1}{2}$ at E and $\frac{1}{2}$ at $C\,D$. Then lay off $bc = \frac{1}{2}$ weight on rafter, $cd = \frac{1}{2}$ weight on rafter $D\,F + \frac{1}{2}$ weight on $C\,F$, $ed = \frac{1}{2}$ weight rafter $C\,F$.

Starting at joint B: — bc is borne by the abutment directly, therefore pass down load-line from b to c; then comes load on $C\,F$: — draw a line through C ∥ to $C\,F$. Now, since we must close our polygon and return to the starting-point, and since the effect of $F\,A$ must be ∥ to $F\,A$, and since the only other force left is the upward reaction of the abutment, which is the same for both E and B, the reaction of the abutment E must $= e\,a = \frac{1}{2}$ of $e\,b$; then draw through a a line ∥ to

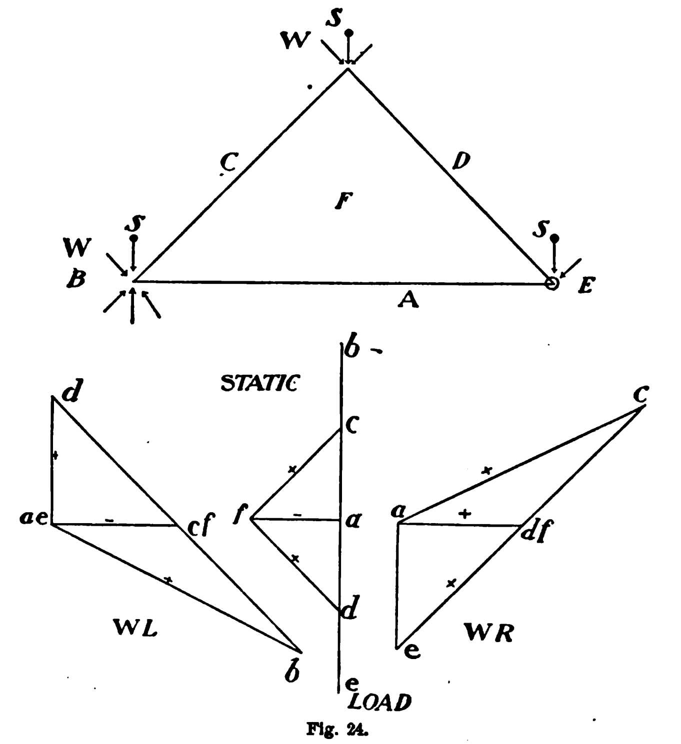


Fig. 24.

$F\,A$ until it reaches $c\,f$ in f; then follow this line from f to a, and then follow from a to b, which brings us to the starting-point; then $c\,f$ represents compression in $D\,F$, since we passed from c to f, and $f\,a$ the tension in $A\,F$ since we passed from f to a, and, as before stated, $a\,b$ is the upward reaction

[1] By George Hill, Consulting Engineer. Continued from No. 891, page 39.

ABBREVIATIONS AND SYMBOLS.

= equal to.	∴ therefore.
∥ parallel to.	□′ square feet.
÷ divided by.	□″ square inches.
× multiplied by.	8* read 8 pounds per lineal foot.
+ added to.	⊏ channel bar.
a^2 a multiplied by itself.	I I-beam.
$a > b$: — a greater than b.	T T-iron.
$a < b$: — a less than b.	L angle iron.
$\frac{a}{b}$: — a divided by b.	⊥ deck beam.
	● round section.

I ton = 2,000 pounds as this is the conventional ton, the legal ton is 2,240 pounds, but is rarely used.
l = the length between supports of any beam or girder or height of any column, always in feet.
b = breadth of any beam or girder, always in inches.
d = depth of any beam or girder, or the least transverse dimension of any column, always in inches.
L = total load uniformly distributed coming on any piece in pounds.
$L^{\square\prime}$ = " " " " per square foot in pounds.
W = concentrated load on any piece in pounds.
S = span of any arch or truss between centres of end pins in feet.
A = area of any section in square inches.
M = maximum bending-moment in inch pounds.
n = distance of centre of gravity of section from either top or bottom edge in inches.
I = moment of inertia, neutral axis through centre of gravity.
R = moment of resistance of section.
r = radius of gyration, in inches.
Sc = safe compressive strain in pounds per square inch.
St = " tensile " " " " " "
Ss = " shearing " " " " " "
S = strain per square inch in extreme fibre.
P_e = upward reaction of support at left-hand end of beam.
P_f = " " " " " right " " " "
e = distance of centre of gravity of load from left hand of beam.
f = " " " " " " " " right " " "

of the abutment. For the joint between C and D we pass down from c to d on the load-line; then we have from d to draw a line ‖ to $D F$ until it meets cf in f, then go up fc to c; fd will be compression, fc will also be compression, as already found.

Wind-Left Diagram:—Load-line:—Wind-effect is always taken as at right angles to the rafter, and will therefore be in

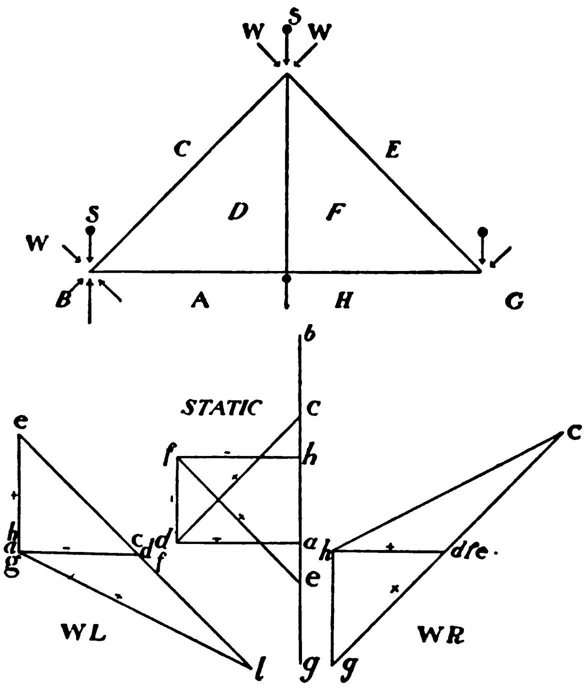


Fig. 25.

direction ‖ to the dotted line. Load-line is ‖ to direction of wind-pressure; draw db ‖ to the dotted line, lay off dc = wind-pressure on ½ of rafter $C F$, and cb = wind-pressure on the other half.

The dotted line passes through centre of rafter and is therefore the resultant of the wind-pressure. Its intersection with $F A$ divides $F A$ into two parts proportional to the reactions of the abutments. In the figure these are equal ∴ f falls at c. Truss is free to slide at E, therefore reaction at E must be vertical. Draw de vertical until it meets a horizontal line through f; then de is the vertical component of that part of the wind-pressure resisted at E, and eb, which closes the polygon, is the reaction of the abutment B.

Now take joint B:—bc, cf (points coincident, since the reaction of the abutment is found, and the line fa must pass through the end of it, and we know already that this line passes through c), fa ‖ to $F A$ tension in tie, $a\ e$ the reaction.

Joint $C D$, dc, cf (coincident), fd.

Wind-Right Diagram:—Direction of wind changed. Amount will be the same. Reaction found as before, for abutment B = ac, abutment E = ae, take joint $D\ E$, de, $e\ a$ (reaction), af = to $A\ F$ (compression), fd (coincident points).

Note the reversal of strain in the tie fa. This illustrates the necessity of the three diagrams. All trusses should have the three made and the results tabulated with their proper signs, so that the pieces and joints may be properly proportioned to resist the strains. Examples of tabulation will be given in the chapter on "Computations."

§ 179. Truss I*a*: (Fig. 25) *Static-Load Diagram:*—Load-line:—$b\ c$, $c\ e$, $e\ g$, gh = ½ of *total* load, ha, ab = ½ of total load, and ab are the reactions at the abutments. *Note* the order in which the load-line is plotted, beginning with the load on the half rafter at the abutment and going around the entire frame to the beginning. Note also the over-lapping of the diagram.

Joint B:—bc, cd ‖ to CD; da ‖ to DA; ab to beginning.

Joint $C E$:—c, e; ef ‖ to $E F$; fd ‖ to $F D$; to d already determined; dc to beginning.

Joint $E\ G$:—eg, $g\ h$, $h\ f$, ‖ to $H\ F$; to f already found; fe to beginning.

Joint $H A$:—ha, ad, df = to $D\ F$; to $f\ h$, to beginning.

Wind-Left Diagram:—Resultant of wind on one side passes through centre of tie, as shown by dotted lines. Load-line ‖ to direction of wind:—Lay off bc, $c\ e$, then draw eg vertically until it meets the horizontal line through the point which divides the load-line into the abutment reactions, then eg is the vertical component of the wind and is the reaction at G and gb is the reaction at B.

Balance of diagram is the same as for § 178.

Wind-Right Diagram:—Same as for § 178.

§ 180. Truss II:—(Fig. 26,) *Static-Load Diagram.*

Load-line:—bc, cd, de, ef, fg, $g\ a$, ab.

Joint $B\ C$:—bc, $c\ l$ ‖ to C, L, la ‖ to L, A, and to a; $a\ b$ (the reaction) to beginning.

Joint $C D$:—cd, dk ‖ to $D K$; $k\ l$ ‖ to $K L$; to l already found; lc to beginning.

Joint $D\ E$:—de, ei ‖ to EI; $i\ k$ to k already found; kd to beginning.

Joint $E F$:—ef, fh ‖ to $F H$; $h\ i$ ‖ to $H I$; $i\ e$ ‖ to $I E$, to beginning.

Joint $F\ G$:—fg, ga, ah ‖ to $A\ H$; hf to beginning.

Joint H, L, needs no analysis, as we have the strains for all of the pieces.

Wind-Left Diagram:—Resultant of wind falls as shown by dotted line, which passes through centre of rafter and is normal to it. This line divides the tie into two parts, which are proportioned to the reaction.

Plot load-line ‖ to dotted line, bc, cd, de, then $e\ a'$, which has the same relation to $a'\ b$ that the two parts into which the tie is divided by the prolongation of the resultant of the wind-pressure have to one another. Note that the reaction of the abutment on the windward side is the larger. Now the end G of the truss has a vertical reaction ∴ draw a horizontal line through a' and a vertical line from e. ea will be one abutment reaction and $a\ b$ the other.

Joint B:—bc, $c\ l$ ‖ to $C L$; la ‖ to $L\ A$; $a\ b$ to beginning.

Joint $C D$:—cd, dk ‖ to $D K$; $k\ l$ ‖ to $K L$, to l already found; lc to beginning.

Joint $D\ E$:—de, ei ‖ to $E\ I$; $i\ k$ ‖ to $I K$, to k already found; kd to beginning.

Joint $E\ F$:—ef, fh, hi, ie to beginning.

Note that e and f, and h and i must be coincident points in order to close right, and are coincident because there is no force at joint $e\ f$, to separate e and f and strain $h\ i$.

Wind-Right Diagram.—Load-line and reactions obtained in manner similar to Wind-Left except that the reaction at G is now greater.

Joint G:—fg, ga, ah ‖ to $A\ H$; hf ‖ to $H\ F$, to beginning.

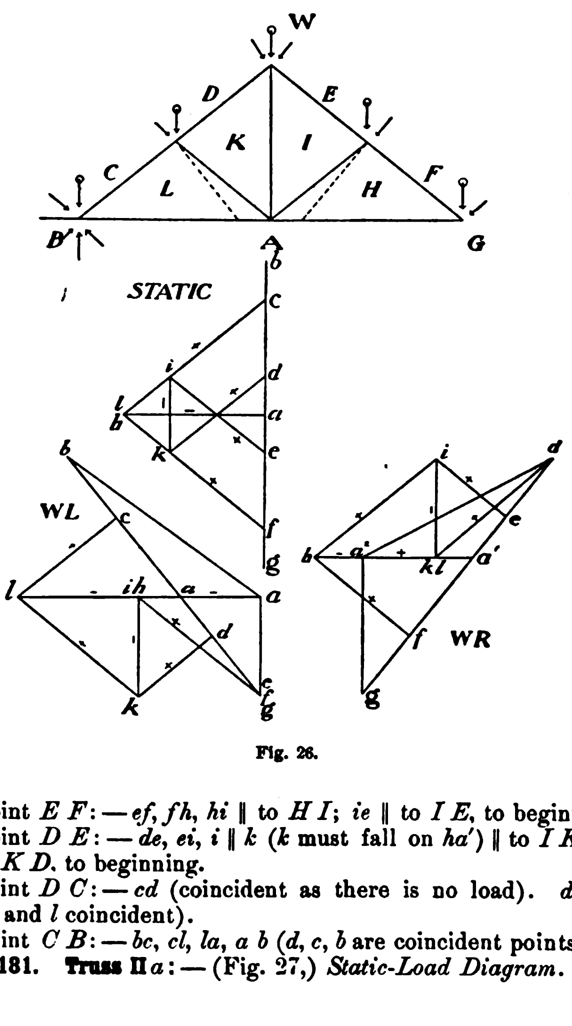


Fig. 26.

Joint $E\ F$:—ef, fh, hi ‖ to $H\ I$; ie ‖ to $I\ E$, to beginning.

Joint $D\ E$:—de, ei, i ‖ k (k must fall on ha') ‖ to $I K$; kd ‖ to $K D$, to beginning.

Joint $D\ C$:—cd (coincident as there is no load). dk, kl, lc (k and l coincident).

Joint $C\ B$:—bc, cl, la, $a\ b$ (d, c, b are coincident points).

§ 181. Truss II*a*:—(Fig. 27,) *Static-Load Diagram.*

Load-Line: — Begin b; bc, $c \parallel e$, eg, gi, il, $l \parallel m = \frac{1}{2}$ total load (when symmetrical); ma, down, $ab = \frac{1}{2}$ total load (when symmetrical); lm and ab = reactions.

Joint B: — bc, $cd \parallel$ to $C\,D$; $da \parallel$ to $D\,A$, $a\,b$.

Joint $C\,E$: — ce, ef, fd, dc.

Joint $E\,G$: — eg, gh, hf, fe.

Joint $G\,I$: — gi, ik, kh, hg.

Joint L: — $i\,l$, lm, mk, $k\,i$.

Joint $M\,A$: — ma, ad, df, fh, hk, km.

Wind-Left Diagram: — Same as Truss II.

Wind-Right Diagram: — Same as Truss II.

§ 182. Truss III: — (Fig. 28,) *Static-Load Diagram.*

Load-Line: — Start at A and go around frame, remembering that at M after plotting all the forces against the rafter, the reaction $= \frac{1}{2}$ the total load under symmetrical loading, and then plot downward the loads on the tie and upwards for the reaction at A.

Joint A: — ab, bc, cr, ra.

Joint $R\,P$: — pr, rc, ce, ep.

Joint $B\,D$: — bd, df, fe, ec, cb.

Joint $D\,G$: — dg, gh, hf, fd.

Joint $P\,O$: — op, pe, ef, fh, hi, io.

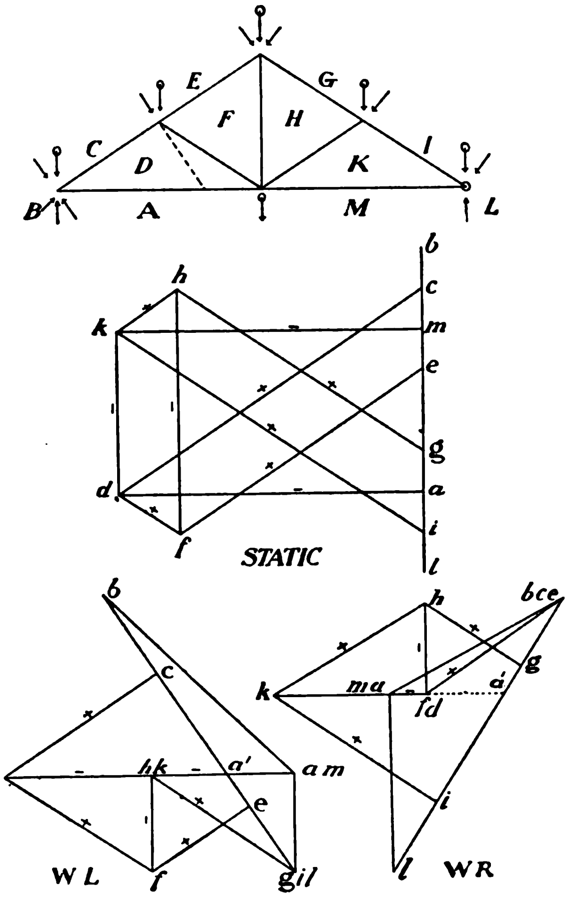


Fig. 27.

Joint $G\,K$: — gk, kl, li, ih, hg.

Joint $K\,M$: — km, mn, nl, lk.

Wind-Left Diagram: — Load-line; ab, bd, dg, line normal to rafter at centre cuts tie into two equal parts ∴ reactions at two abutments are equal. Find vertical component at M, the roller end, by drawing $g\,o$ vertically and $h\,o$ horizontally to an intersection, h being the centre point of the load-line, then $g\,o$ is the reaction at M, and $o\,a$ at A.

Joint $A\,B$: — ab, bc, cr (or co, or cp, or ca) ra.

Joint $P\,R$: — pr (coincident, as there is no load), rc, cc, ep (c and e coincident points); this might have been expected, as this part of the truss was triangular without $C\,E$ and there would be no strain in it, in consequence.

Joint $B\,D$: — bd, df, $f \parallel e$, ec, $c \parallel b$.

Joint $D\,G$: — dg, gh, hf, fd.

Joint $G\,K$: — gk, kl, li (coincident); ih (coincident), since the pressure is transmitted directly down $G\,L$, and the space $H\,L$ is triangular, $n\,g$.

Joint $K\,M$: — km, mn, no, ol, lk.

Joint $O\,P$: — $o\,p$, $p\,e$, $e\,f$, $f\,h$, hi, io.

Wind-Right Diagram: — Load-line dg, gk, km, get reactions as before mo, od.

Joint M: — km, mn, nl, lk. (Note that in this case n and l are coincident; this is not always so.)

Joint $N\,O$: — no, oi, il, ln, all coincident.

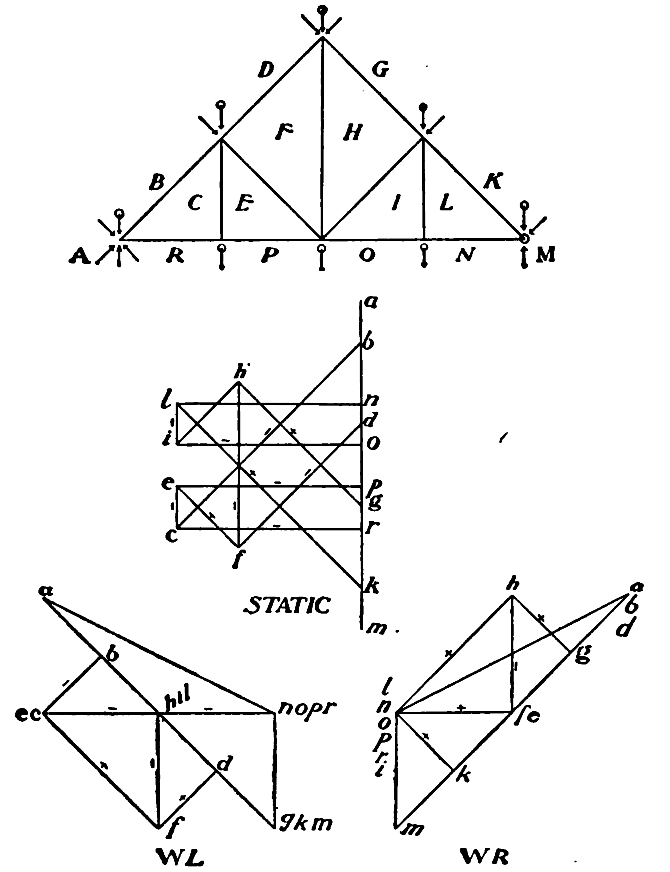


Fig. 28.

Joint $G\,K$: — gk, kl, li, ih, hg.

Joint $D\,G$: — dg, gh, hf, fd.

Joint $B\,D$: — no force at joint and as pieces fh, ep, cr, and $b\,f$ complete the triangle, it only remains to find the strains in them. df and fh are already found, find ep by

Joint $O\,P$: — fh, hi, $i \parallel o$, op, $p \parallel e$, ef.

[To be continued.]

TOWN-GATES IN SOUTHERN GERMANY.

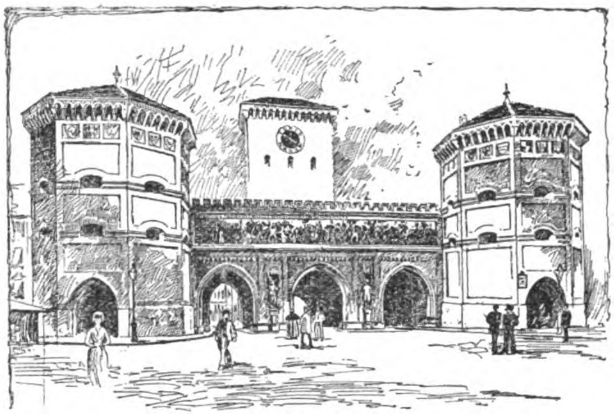
Sendlinger Thor.

SOME specimens were given in a former article[1] of town-gates in Northern Germany. These were selected from among the Gothic tower-gates of the town of New Brandenburg, that belong to the fourteenth and fifteenth centuries. Burned brick compose the material of the masonry, good building-stone being wanting in the alluvial plain of the north, and this material caused a modification of the Gothic style of decoration. In the north, also, where few sites were on natural elevations, the construction of gates likewise remained peculiar and different in two or three particulars from that of town-gates elsewhere, all of them being flanked by towers of great height.

In hill towns of the south, on the contrary, such towers were unnecessary. Height in towers had once been of use, and it remained

[1] See the *American Architect* for May 2, 1891.

of use so long as stone missiles were a means of warfare, such missiles receiving the greater destructive impetus and force the higher the point was from which they were hurled down upon the enemy below. But elevation lost its importance as a means of defence so soon as gunpowder began to be employed, and a horizontal line of



Isar Thor.

attack took the place of the old vertical method. Towers, in consequence, were built lower, with low stories and few of them. Naturally, some examples of the early feudal high tower-gates, like the famous gate-tower of Basle, are still found here and there in the south, but the general rule is low gates.

Munich in Bavaria, a town which occupies a site upon a high plateau, may serve as an example of a typical South German town. The gates are all of the low sort. They are five in number, three of which date from feudal times: the so-called Sendlinger Thor, that opens upon the highway leading northward to the village of Sendling; the Isar Thor, in the Isar Vale, on the eastern side of the city, and Karl's Thor, in the western quarter of the town. An ancient southern gateway that opened upon the highway to Schwabing, and went by the name of the Schwabinger Thor, was levelled with the town-wall, and a modern gateway occupies its place. This latter composes the fourth gate of the city, and is known as the Sieges Thor, or the Arch of Triumph. The fifth gate, finally, is the Propyläen, and is found in the aristocratic northwestern portion of the town, where Brienner Street crosses Theresien Street. Both these latter-named structures are new, while the old feudal gateways are as old as the town itself; that is, as old as the incorporation of Munich.

The name "Munich" occurs for the first time in the annals of the monastery of Lake Tegern in 1102, and the figure of a little monk (*Mönchen*), used to distinguish the settlement, was taken up in time into its coat-of-arms, and historians feel themselves warranted in supposing that this figure gave rise to the town's name of München. In this early century (the twelfth) the importance of the place, which is now derived from its production of beer and paintings, was then derived from its storehouses of salt from Reichenhall and Hallein — an interesting bit of history, inasmuch as it was perhaps the ancestral consumption of salt that accounts for the insatiable thirst of latter-day Müncheners. The town remained a mere depôt during two centuries. But in those stormy days of incessant fighting and industrial interruptions, a good depôt of salt was a treasure worth taking precautions to protect, salt being an essential of life, and Duke Ludwig the Lion had the town provided with defensive walls.

His successors then saw to it that the walls were kept in good condition, and Ludwig the Severe built a castle for himself within their enclosure and fortified them, in 1254, with a moat and the walls' four gateways with towers. A great conflagration destroyed these towers in 1327, but the gateways were rebuilt again by Emperor Ludwig, called "The Bavarian."

Such in brief is the history of the origin of Munich's old gates. The Sendlinger gate, in those early times the outermost gate, but now close to the busiest part of the city, remains in a condition of shabby semi-demolition, and I select it for the first number of my illustrations; it is not older in date than the Isar or Karl Thor, but it is the oldest-looking gate in the city.

Its plan has not remained intact, and what is seen in the illustration — a portion of wall between two towers — is all that there is of the structure. The wall is a mere piece of the ring-wall that once encircled the town. Three openings pierce it. These openings have Gothic, or pointed, arches, and the middle one is high and wide in order to admit of the passage of calvacades and wagons, while the side openings are lower and narrower, being designed for foot-passengers. The pulleys and chains, by means of which the drawbridges of these passages were lowered and raised, were protected by a shelf-roof against the rain, the holes for the rafters of which roof are still visible, whereas the chain-slits have been filled-in with mortar. The gates of this Thor, as of all the other gateways to be described, have been lifted off their hinges and split into pieces, only a single pair of gates being left in all the city that are daily opened and closed, this exception being the gates across Pranner Strasse near the Parliament building. Above the archways of the Sendlinger Thor, the interior of the wall, which is six feet in width, is hollow, and room is thus afforded for a *gang* or passage. Two windows open into it. These are small and square, with arched lintels, and with sides that contract towards the interior in Gothic fashion, so that their size outside is larger than within. During the Thirty Years' War, when Munich was beleaguered and taken (1632) by Gustavus Adolphus, these two apertures of the Thor were occupied by the nozzles of guns, similar to those still to be seen in the first story of the tower of the old castle in Darmstadt. Whether the apertures were the same in number previous to this date, it is now impossible to decide. But it is held by several historical critics to be probable that they were not the same, but more numerous; that this closed gallery, in fact, was originally the roof of the structure, the coping of the wall, and that the apertures were two of a row of loop-holes; that this gate, in other words, resembled the Isar and Karl gates. It is chronicled that the gateway toward Sendling was "strengthened" in preparation of the attack of Gustavus Adolphus, and this "strengthening" may have consisted of the carrying-up of the walls to a second story and making on this second story a new battlement, while the old was enclosed within the walls in the shape of a passage for the men who had charge of the guns there.

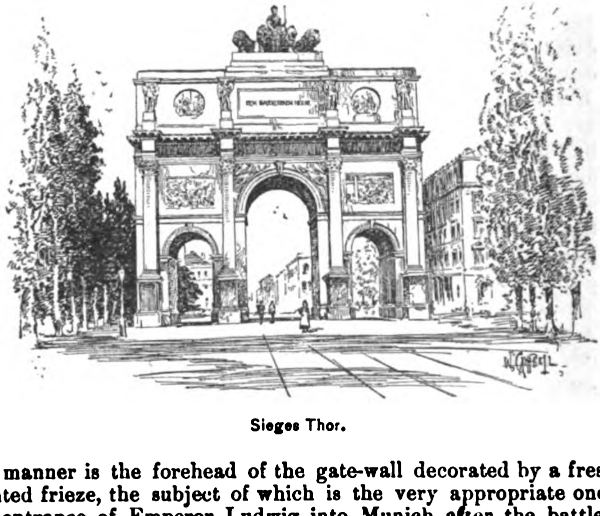
Nevertheless the present form of the gate is wholly and purely feudal in style. If it has no likeness of itself in Munich, it has in other places. The enclosed gallery near the top of the wall is found in the authentic fourteenth-century shield-wall of Berneck Castle, and can be traced in German gate-walls down to the sixteenth century. The close-lying, scanty roof, with the line of small apertures hugged under it, is, moreover, almost precisely like the roof-wall of the otherwise pompous outer gate of Tübingen, an illustration of which was given in No. 832 of the *American Architect*.

As for the two towers united at the right and left with the gate-wall, they attain to a height of four stories, being thus one story higher only than the latter. Their two middle floors connect inside with the two passages within the wall, — the gallery, just described, for cannon, and the garret-passage close under the roof of the gate-wall. Both towers are octagonal and are pierced at every story by one aperture in each of their eight sides. They terminate in a battlemented platform, which is covered by a low eight-sided roof. The outer walls of the ground-floor, which were originally massive, have been broken into, as modern wants have required, for the construction of doorways. All traces of the gate court-yard are lacking; so also are all traces of the inner-gateway wall and its tower.

In Karl's Thor, at the west, the middle archway has been widened to near the same width with the pavement of the street that it spans. Its battlement and towers have been repaired, moreover, and the whole structure, the masonry of which is of brick like that of Sendlinger Thor, has been covered neatly with a fresh coating of cement (*putz*).

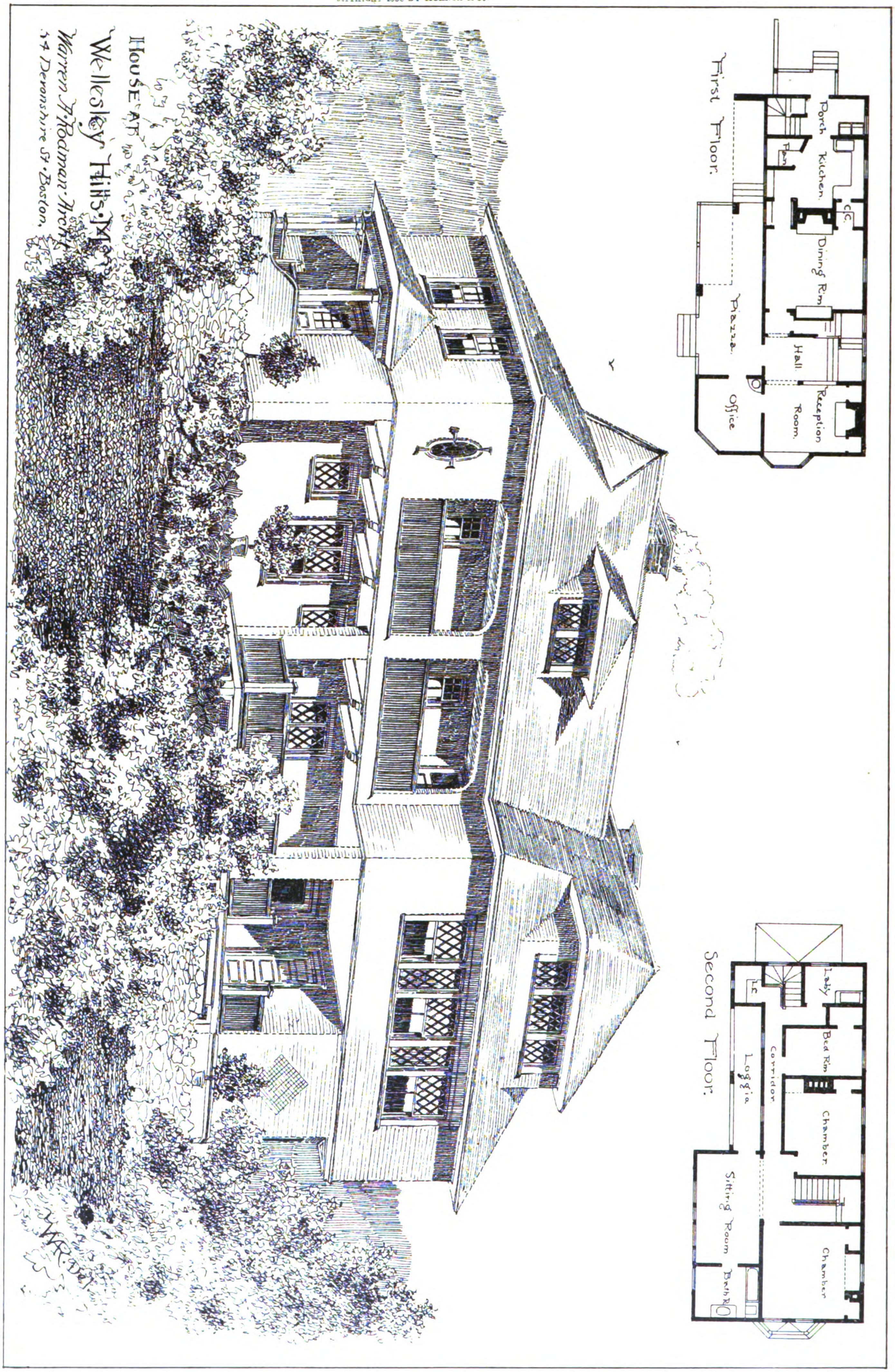
Isar Thor, however, conveys best an idea of how the gates of Munich looked in the days of their young and middle-aged glory. Here the constructive divisions of gate-wall and towers are sharply and perfectly marked, and every essential portion is at hand. The pointed archways of the restored building have Gothic mouldings; the Gothic wall-spaces have their figures, and the figures, their pedestals and canopies; the frieze has color, and the battlement is a true parapet. The student sees at a glance that the style is not the academical, authoritative, "pure" style of the *Hütter*; but none the less is it interesting, for it is the military-Gothic style of Albert Dürer. The Renaissance-like marking of the horizontal division between stories, the octagonal barbacan towers — these are details that Dürer, the Leonardo da Vinci of Germany, favored and wrote about, and the innovation of the horizontal mouldings, as applied here, lends a suitable expression to the whole structure of being bound together by firm chains.

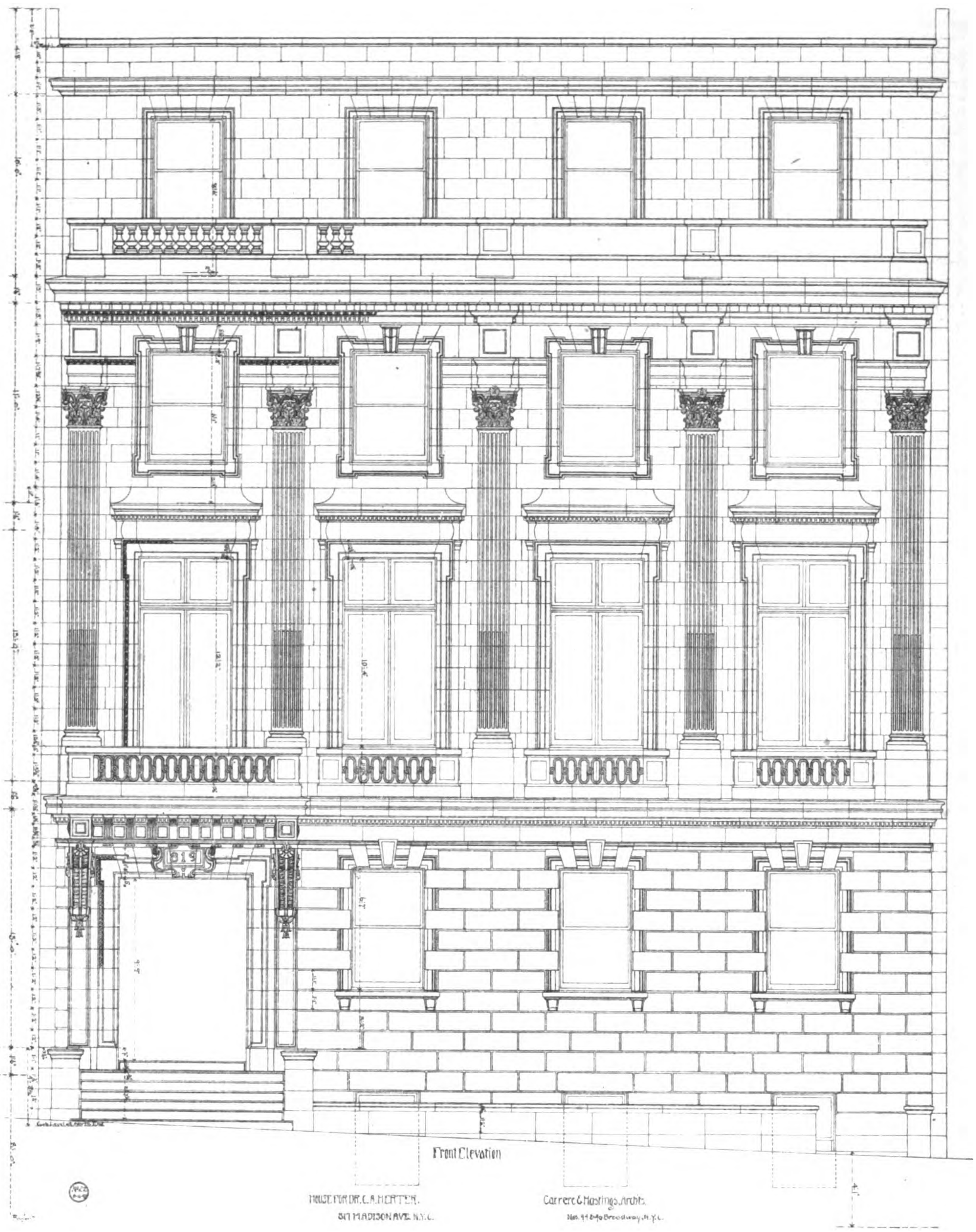
Beneath the eaves of the towers' roofs there are fresco-paintings in the form of shields, each shield representing one of the coats-of-arms of counties and towns belonging to the dukes of Bavaria. In

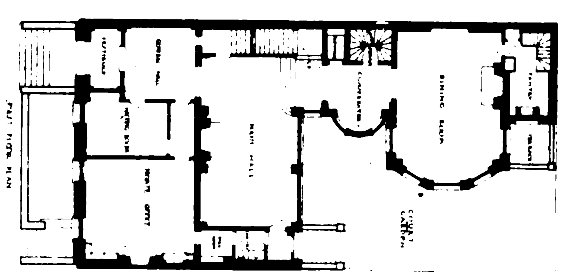


Sieges Thor.

like manner is the forehead of the gate-wall decorated by a fresco-painted frieze, the subject of which is the very appropriate one of the entrance of Emperor Ludwig into Munich after the battle of Ampfing. The designer of the painting was Cornelius, while the


House at
Wellesley Hills, Ms.
Warren R. Rodman Archt.
54 Devonshire St. Boston.
First Floor.
Porch
Kitchen
Pan.
C.C.
Dining Rm
Piazza
Hall
Office
Reception Room
Second Floor.
Lady
Bed Rm
Corridor
Loggia
Chamber
Sitting Room
Chamber
Bath R.





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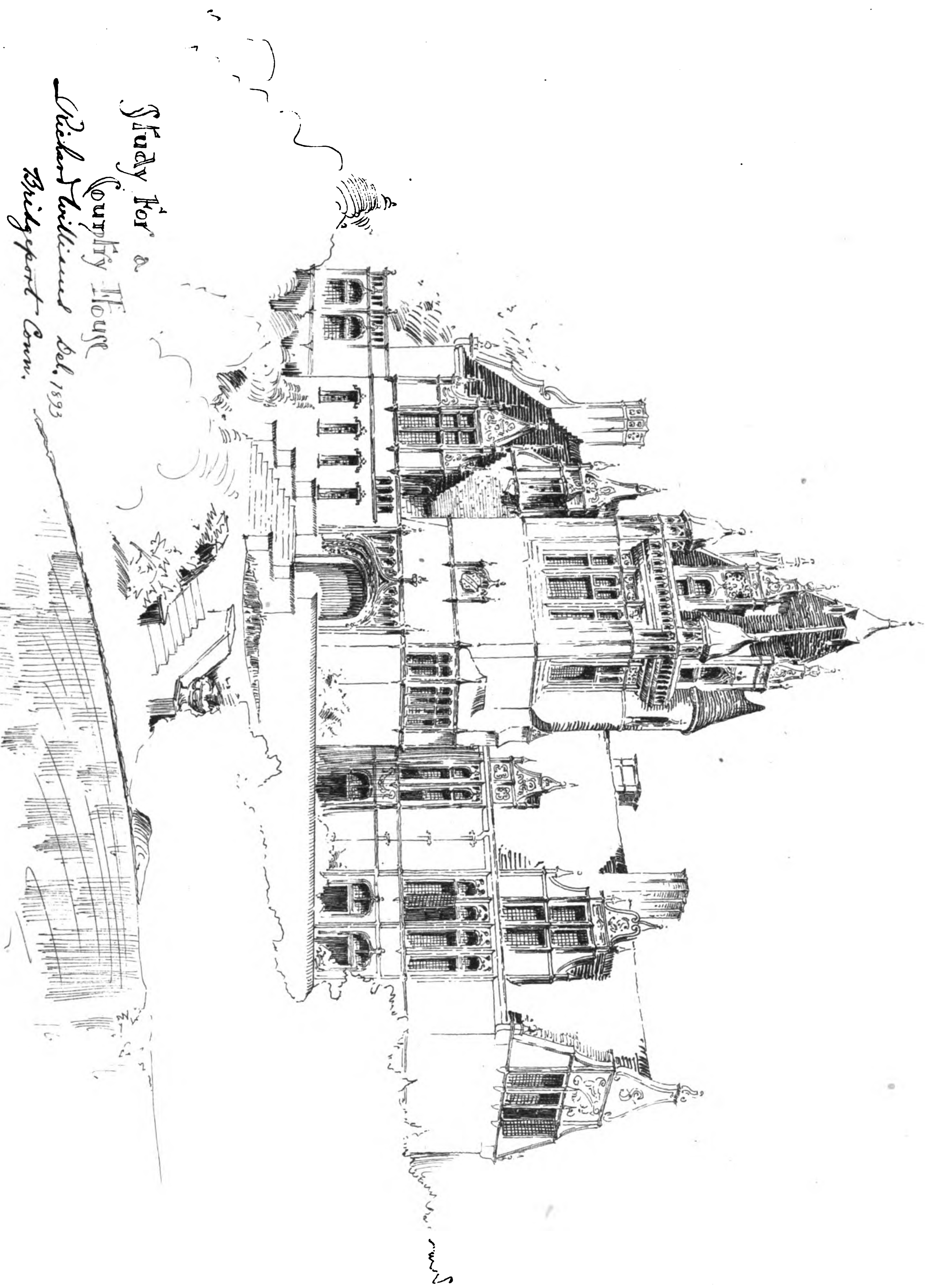
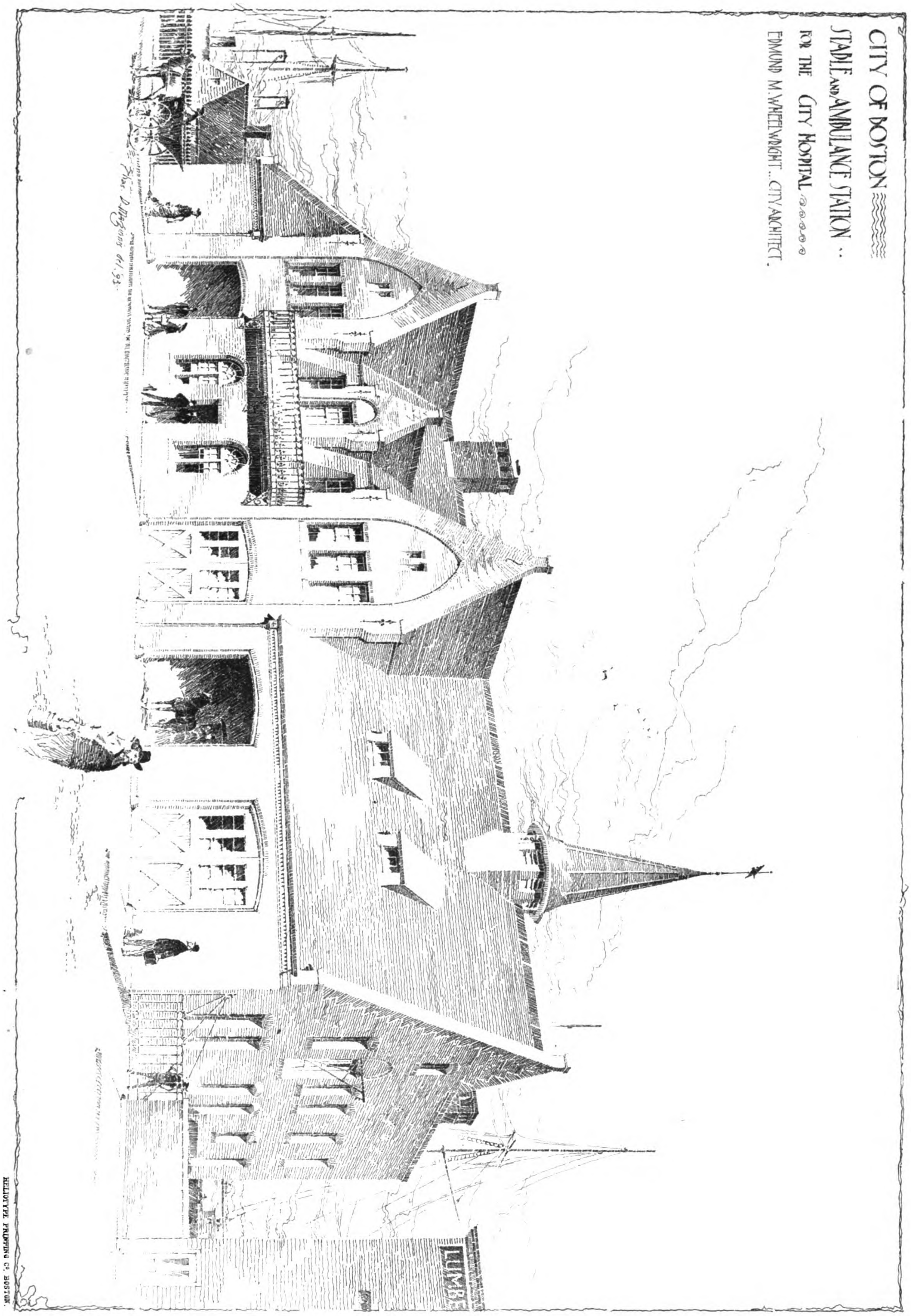
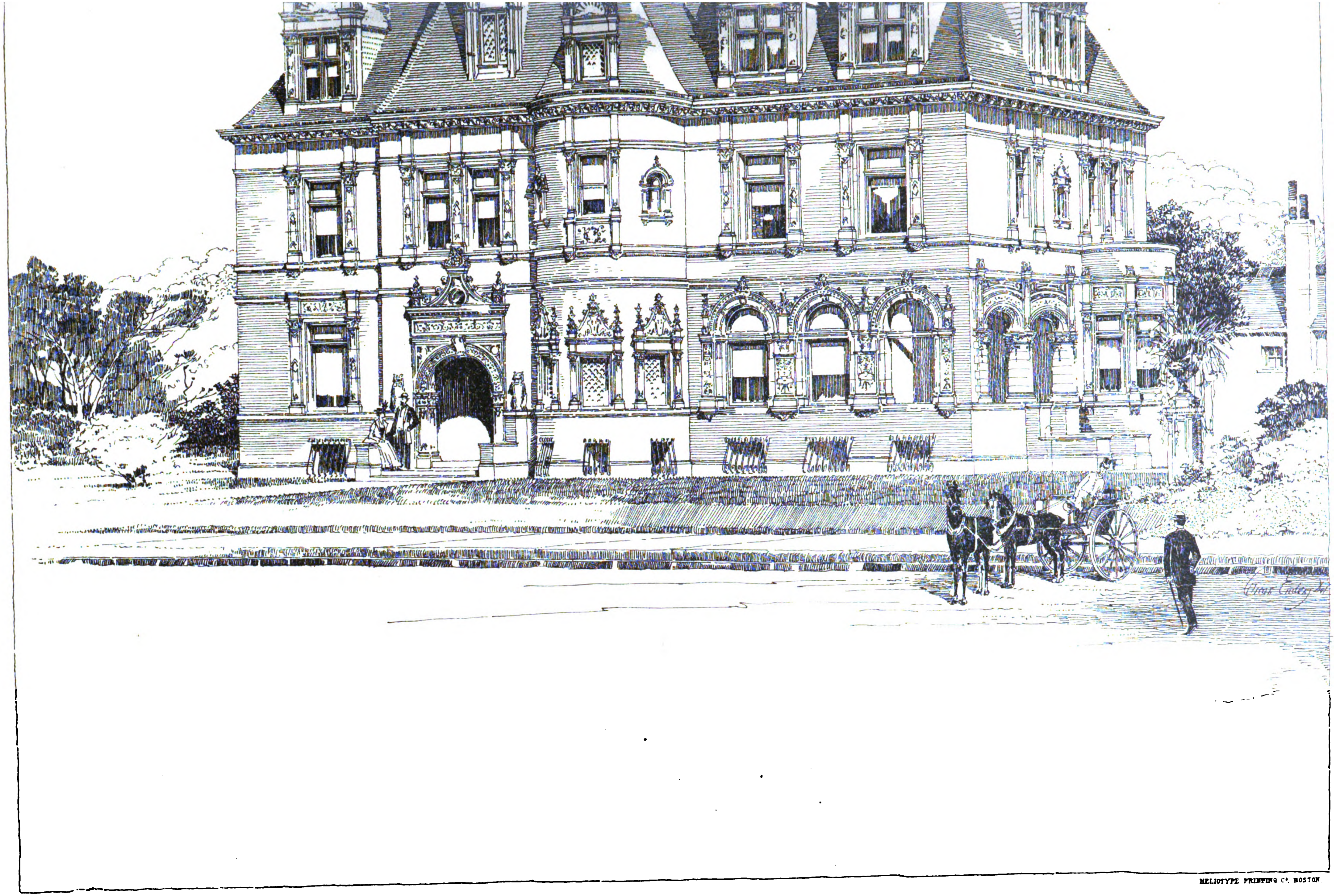

Study for a
Country House
Richard Williams Del. 1893
Bridgeport Conn.


CITY OF BOSTON
STABLE AND AMBULANCE STATION
FOR THE CITY HOSPITAL
EDMUND M. WHEELWRIGHT... CITY ARCHITECT.
LUMBE



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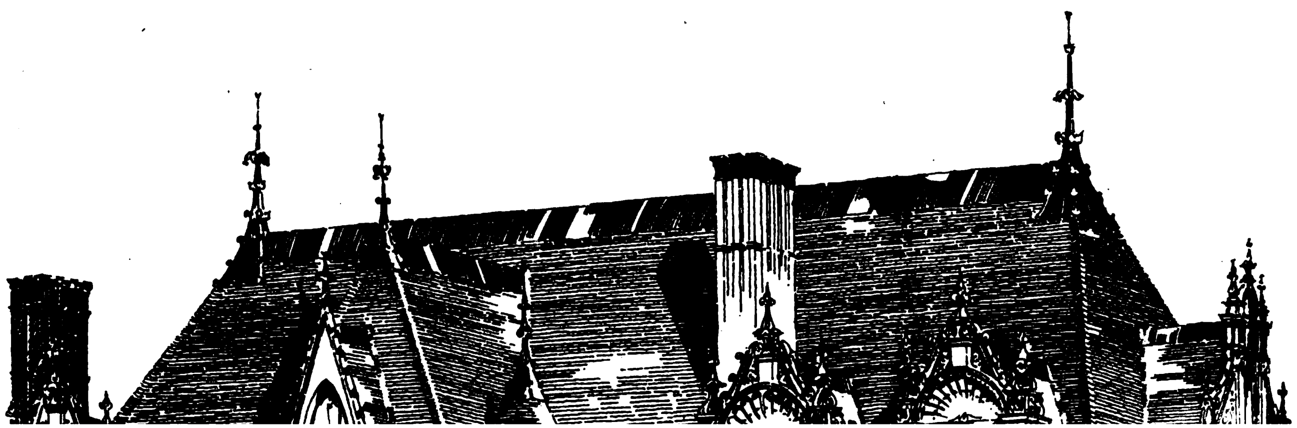
RESIDENCE OF W. K. BIXBY, ESQ. SAINT LOUIS.

W. ALBERT SWASEY ARCHT

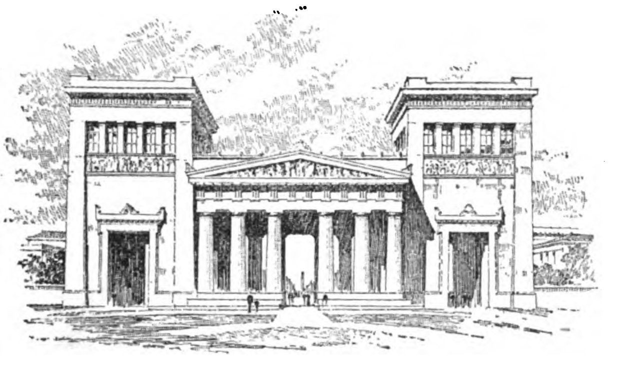


painter of it was Neuhers, who finished the work in 1835. Such coloring on such a structure is found almost nowhere in the north; but fresco-painting was a decorative means of Gothic art in Germany, and the Gothic towers of Prague, Vienna and Innsbruck display shields sculptured, and gilded with gold, or painted *al fresco*, as on the Isar Thor.

The court or cage of the gateway is equilateral in shape. The inner gate-wall is provided with a square tower rising over the middle portion to a height one story greater than the outer flanking towers. Of late years the tower has been furnished with a town-clock, and serves as an outlook station for fire-wardens. Traffic goes on uninterruptedly beneath its archways. The three portals of the gate-walls have all been given over to the passage of street-cars and wagons, pedestrians continuing their way under the arched passages which have been cut through the gate-towers.

As a bit of architecture representative of the feudal portion of the town where it stands, and of its gay and boisterous life, the Isar Thor is both a characteristic and an appropriate monument. In style it is in harmony with all the public buildings in its neighborhood: the Gothic churches of St. Paul and of the Holy Trinity, the Town-hall, the Column of Our Lady Mary, and numerous fine old burgher houses of the Vale.

In strong contrast with the Isar Thor, but altogether in keeping with the new portions of the city where they are situated, appear the other two great gates of the town, the Grecian Propyläen and the Roman Sieges Thor. Both of these are modern structures composed of grayish-white Isar limestone, and are kept isolated from contact with other buildings. As the old gateways appear part and substance of old Munich, and as representative of the animal life of its beer-drinking, hard-fighting burghers, so do these modern gates, in their classic dignity, speak of new Munich — the Munich of King Max and King Ludwig I, the Munich of Schwanthaler, Cornelius and Kaulbach, the Munich of the Pinakothek, of the Glyptothek, and of the yearly great Exposition of Fine Arts. The two classes of gates are embodiments, in short, of the twofold nature of



Propylaen.

the city's inhabitants, and aid greatly in stamping upon the town a character completely original.

The Arch of Triumph (Sieges Thor) rises in the middle of a long, wide thoroughfare, the beginning of which is a street, headed by a portico called the "Hall of Generals," and the close of which is a broad, long avenue, planted on both of its spacious sides with tall, pillar-like French-poplar trees. In its neighborhood are the University, the Royal Library, the Art Academy, the Polytechnicum, the Basilica of Ludwig, and the palaces of Prince Ludwig and Prince Anulf of Bavaria — all structures of imposing, vast dimensions, without a single humble or unfinished building within their view. If the spot is not classic, it yet has the essential traits of classicism, being simple, grand and vast. A Roman archway does not seem out of place on it, there being such evidence on all hands of an ambitious, Roman-like and splendid energy having been here at work creating. The faults of detail that one observes in the construction and decorations of the buildings that compose the long vista of Ludwig Street, as well as in the arch itself, diminish in importance when both the street and the Thor are considered as one complete, immense work of art. Both are the general conception of King Ludwig I, Thorwaldsen's friend and pupil, his architect being Fredrich von Gärtner, and his sculptors Johann Martin Wagner and Johann Halbig; Gärtner's work being the plan of the Thor, Wagner's the low reliefs representing scenes from the history of Bavarian arms, and Halbig's the famous lions that draw the chariot of Bavaria Victrix on top. The gateway was begun in 1844 and was completed in 1850.

A mile distant rises the colossal structure of the Propyläen. Ludwig I, who had known Lord Byron in Italy, and had taken the liveliest interest in the struggle of Greece for liberty, caused its erection in commemoration of the Grecian war for independence. The gateway, at the same time, was made to serve, by the choice of the site for it, as the entrance to the temples of art in which the royal collections of sculpture were housed, the Art-hall standing off in the rear of a roomy grass-plot, at the right, and the Glyptothek at the left of it.

The architect of the Propyläen was Leo von Klenze, the sculptor of the figures in the pediments and on the friezes being Schwanthaler: the gateway was begun in 1846 and finished fourteen years later, in 1860. Here the passageway for pedestrians is in the middle, being in this particular unlike all the other gateways of the city.

Taken together, the fine gates of Munich compose a feature of it, and the modern ones being conceived and built as the introduction to special groups of building, they conform to an artistic ideal. In a future paper I will offer illustrations of gateways of other South German towns. I bring the present paper to a close by suggesting the question to our American architects, whether gateways, those oft-quoted portions of ancient cities and the picturesque adornment of the feudal quarters of Continental towns, cannot be made appropriate monuments of American cities also?

FREDRICH VON GAERTNER, who was born at Coblenz, in 1792, came of a race of builders and architects, and after studying at the Munich Academy of Fine Arts, was sent to Paris, Rome, Naples and Sicily and thence to England, in order to complete his education. Returning to Munich in 1819, he became a professor in the Academy of Fine Arts, and in the course of his extremely busy life, which ended in 1847, he designed the following important architectural works: the Ludwig Church, the Royal Library, the Asylum for the Blind, the University, the St. Ann Seminary, Max-Joseph Academy, the Hall of Fame, Wittelsbach Palace, the Arch of Triumph and the Cemetery, at Munich; the Royal Palace in Athens; the Kurhaus in Brückenau; the Kursaal and Protestant Church in Kissingen; the Town-hall in Zwickau; the restoration of the Cathedral in Bamberg; and the Pompeiian House in Aschaffenburg.

JOHN MARTIN VON WAGNER came likewise from a race of artists, and was a painter, a sculptor and a distinguished writer on archæology. Ludwig I met him in the studio of Thorwaldsen in Rome, in 1805, when Wagner was thirty-two years old. The prince engaged him to go to Greece to buy antiques, and Wagner secured, among other sculptures, the famous Ægina marbles, now in the Glyptothek. The chief productions of his own hands are the "Eleusinian Fête," the frieze of the Walhalla, near Regensburg, ninety-two metres in length, the metopes of the Glyptothek in Munich, and the sculptured reliefs of the Arch of Triumph. Wagner, who was born in Würzburg, died in Rome, on the 8th of August, 1858.

JOHANN HALBIG, a young friend of Wagner and a favorite of Ludwig I, grew up in the stern, classical traditions of these two devotees of art, but emancipated himself so far in the course of time as to give a touch of realism and *genre* to nearly all his designs. Among his early decorative sculptures are the Lions of the Pinakothek, the colossal Atlantes of the vestibule of the St. Petersburg Museum, and the figures of Raphael, Titian and other portrait statues in the same building, the Lions on the Arch of Triumph, the Lions of the Wittlesbach Palace, and the colossal Lions of the Harbor of Lindau. His chief later works include the portrait statues of Count Platen, in Ansbach; of Frauenhofer, in Munich; of the Palatine Joseph, in Pesth; the ideal statue of a Nymph, in New York; a group in the same city personifying "Emancipation," and finally, a colossal "Passion," in Oberammergau. Halbig was born in 1814.

LEO VON KLENZE had the happy and unusual fate among architects of being born and bred in luxury, and of becoming celebrated before he had built anything but models. His father was a landed proprietor, who sent him to the University of Berlin. Here Leo met Schinkel, and in Paris, subsequently, he enjoyed the instructions of Durand, Percier and Bourgeois. From Paris he went to England, and from England to Italy, where he studied the architectural remains of Pæstum, Agrigentum and Selinus. An Italian nobleman recommended him to King Jerome, who gave him the title of Court Architect, a title that at least enabled him to make a sketch of a "Peace Memorial," and, what is of more importance, to get the members of the Congress of Vienna to look at it. The members instantly decided Klenze to be a genius, and this characterization was spread from Vienna, at that time (1810) the centre of Europe, to all Continental courts. The ambitious Court of Munich invited him thither, and, one after the other, gave him orders for the following buildings: the Glyptothek, Leuchtenburg Palace, the Royal Riding-school, the Bazaar, the Department-of-War Building, the gateway to the Royal Palace Gardens, the Post-office, the old Pinakothek, the east and west façades of the Royal Palace (known as the Königsbau and Festsaalbau), the Church of All Saints, the Hall of Fame, the Odeon, the Walhalla, near Regensburg, the Temple of Emancipation, near Kelheim, and the Propyläen. In 1832, Otto, the second son of King Ludwig I, was made King of Greece, and Klenze was called upon to rebuild Athens. He consequently journeyed thither, reformed the governmental plans for the new city, made designs for restoring the monuments on the Acropolis, and built the Pantechnicon. Meanwhile the Russian Court became ambitious of securing the services of Klenze, and the architect journeyed seven times, between the years 1839 and 1852, to St. Petersburg. The chief of his buildings in this capital are the Museum, the Palace, and the Church of St. Isaac. No man of his time designed more monumental buildings in so many capitals. He was an enthusiast of Hellenic art, and was wont to declare: "There is but one architecture, and that is the Hellenic; all other architectures are architectural styles." Leo von Klenze was born in 1784, near Hildesheim, and died in Munich in 1864.

SCHWANTHALER, again, is an example of genius descending from father to son, the elder Schwanthaler being a sculptor, and established in Munich when Ludwig was born there, in 1802. In Munich Schwanthaler was educated; here, also, he worked, and near Munich he built for himself Castle Schwaneck (now owned by an American lady). Munich, in return, has named a museum and a street after Schwanthaler. Any lexicon of art will furnish a full list of his extremely numerous works. The best of them embody the spirit of Romanticism, which was the true spirit of his times. In Munich, Schwanthaler's principal groups in marble or bronze are, the frieze representing the Argonauts; the reliefs representing scenes from Hesiod, Pindar and other Greek poets in the Königsbau; the frieze of the Saalbau; the pediments of the Glyptothek and of the Propyläen, the reliefs of the Ægina, Niobe, Roman and Trojan halls of the Glyptothek, and the Bacchus frieze of the dining-hall of the Palace of Duke Max of Bavaria. Other notable works of Schwanthaler's in Munich are: the twelve colossal statues in the Palace (Coronation or Throne Hall) of Wittlesbach princes, numerous portrait-statues in the Hall of Fame, and the "Bavaria," a colossal female figure nineteen metres in height, placed on the knoll of Therese Meadow, in front of the Hall of Fame. Schwanthaler died in 1848.

L. VON KROCKOW.

COMPARATIVE MUNICIPAL BUILDING LAWS. — XXII.

[*Note:* — In these tables bracketed letters invariably refer to preceding passages in the same column.]

Limitations to Use of Wood.

Boston: — *a. In First and Second Class Buildings,* all party and bearing partition walls above foundation shall be built of brick, and no such party or partition wall shall be furred with wood, but plastered on masonry or metal lathing.

b. In Second-Class Buildings, all exterior parts more than 45′ above sidewalk, except window-frames, sashes, and blinds, shall be of metal, stone, brick, or other equally incombustible material.

Baltimore: — *c.* Exterior gutters and cornices to be of fireproof material. No timber shall be used in wall where stone, brick, or iron is commonly used,

d. Except bond-timbers and lintels, as provided by law or approved by Inspector.

e. No exposed bond-timber in wall shall exceed in width and thickness that of course of brick.

Brooklyn: — *f.* No timber shall be used in front or rear walls where stone, brick, or iron is commonly used.

h. No wall-strips in any wall shall exceed ½″ thickness nor 2½″ width.

i. No bond-timber in wall shall exceed 4′ in length; such timbers 18″ apart longitudinally on either side of wall, and continuous line thereof shall be broken by inserting bricks of not less than 12″.

j. No wall shall be supported in any manner on wood, but wholly on brick, stone, or iron, and no wood shall be used between such wall and such supports.

Charleston: — (See "*Supports over Openings.*")

Chicago: — (See "*Cornices.*") (See "*Columns.*") (See "*Partitions.*")

k. Wooden ceilings in shops, stores, and storehouses are prohibited. *Stairways* shall not be enclosed with partitions made of plank, boards, flooring or scantling unless plastered on both sides. *Factories, mills or warehouses more than three stories high, and with area more than* 3,000 *square feet,* shall have all stairways of incombustible material.

l. Piazzas or open porches shall not be inclosed, except to form vestibules to entrance-doors or to protect stairways. Wooden flag-poles permitted, but braces and other parts shall be of iron.

m. On business buildings above first story, and on other buildings when more than 30′ *above sidewalk grade,* appendages, if not wholly of incombustible material, shall be enveloped in metal. Dormers, cornices, mouldings, balconies, bay-windows, towers, spires, ventilators, etc., shall be considered as appendages.

Cincinnati: — *n.* Appendages such as skylights, dormers, cornices, gutters, mouldings, eaves, parapets, balconies, bay-windows, towers, spires, ventilators, erections over elevators, turrets, lantern-light, or other erections on roofs, if not wholly fireproof, shall be enveloped in incombustible material. Stairways shall not be inclosed with partitions made of planks, boards, flooring, or scantling unless plastered on both sides or covered with metal, except in private residences. Stairways shall not be enclosed with partitions made of plank, boards, flooring or scantling unless plastered on both sides or covered with metal.

Cleveland: — (*n*).

Denver: — *o.* No timber shall be used in wall of brick building except arch-forms for interior arch-openings. (*e*); (*d*).

Exterior parts of brick buildings in inner fire-limits, and, outside said limits, all exterior parts of brick buildings over 35′ high, shall be made of or covered with incombustible material.

Detroit: — *p.* No wall or part of wall shall be built upon any wooden beam, girder, or support. Stairways enclosed in wooden partitions must have such partitions plastered on both sides.

District of Columbia: — Structures or projections above or outside roof (such as domes, cupolas, pavilions, towers, spires, pinnacles, buttresses, lanterns, louvres, dormers, skylights, scuttles, ventilators, cornices, gutters) shall be made of or covered with cast or wrought iron, other metal, stone, mortar, or other incombustible material.

Bay and oriel windows and tower projections may be constructed upon brick or stone buildings with frame of wood, if covered with incombustible material and approved by Inspector.

Kansas City: — *q.* External parts of brick buildings within fire-limits more than 45′ above level of sidewalk shall be made of or covered with incombustible material. (*o*).

r. Ceilings of *buildings used for store purposes exclusively, and not more than* 50′ *in height above sidewalk* (exclusive of chimneys and party-walls above roofs), may be covered with wood, provided they are backed with asbestos paper or other incombustible material throughout their extent.

Ceilings of *stores having tenement rooms or offices above first story* shall be covered with wire-lath or tile as provided in Sec. 22.

s. All ventilating-ducts shall be of incombustible material.

Louisville: —

u. Scantling partitions shall not be employed as supports of roof or floors except in dwelling-houses.

Memphis: — (*c*), except lintels as provided in law.

Milwaukee: —

Minneapolis: — (*m*); (*u*).

v. No wall shall be supported upon wooden supports. Such supports shall be of iron, brick, or stone, and rest on sufficient stone or metal templates.

(*o*), arched forms not to rest on wall exceeding 2′.

Nashville: — Appendages such as skylights, dormers, cornices, gutters, mouldings, eaves, parapets, balconies, bay-windows, towers, spires, and ventilators over elevators, if not wholly fireproof, shall be enveloped with incombustible material, provided where elevator roof projects above roof, wall above roof of building shall be inclosed with glass.

Newark: — No wall shall be cut off or altered below, or be supported by wood, but shall be supported by brick, stone, or iron.

New Orleans: — No wall of stone or brick building shall be supported on wood, but on brick, stone, or iron. No wood or timber shall be used between such wall and supports, nor shall any wood or timber be used or imbedded in wall.

New York: — (*c*), except lintels as specially provided by law.

Bulkheads of dwellings (except as specified in Sec. 492) may be built of wood, and then covered with not less than 2″ of fireproof material, or filled-in thickness of studding with such material, and covered on all sides with metal, including sides and edges of doors.

Omaha: — Plank or board partitions in brick buildings in any one story shall not aggregate more than 400 square feet, measured on one side. (*s*); (*u*).

Exterior parts of brick buildings more than 45′ above sidewalk level shall be made of and covered with incombustible material.

Philadelphia: — *w.* No rear, party or division wall shall be supported on any wooden girder or other wooden support, except that under party alley wall where alley does not exceed 4′ in width, and over piazza on other openings not exceeding 6′, wooden girders may be used.

Pittsburgh: — (*w*).

Providence: — No rear, front, party, or division wall of brick or stone shall be supported by wooden girders, rafters, lintels, or other wooden support, but upon iron, brick, or stone of sufficient strength. (*o*).

Exterior parts of buildings more than 40′ above level of finished grade shall be made of or covered with non-combustible material.

St. Louis: — It is unlawful to support any wall more than one story high upon wood; but all such supports shall be of iron, brick, or stone, and of sufficient strength and size.

In business houses, use of ceiling-boards on ceiling and walls is prohibited, except in porches or for wainscotting not exceeding 6′ high.

San Francisco: — No brick or stone wall supported on wooden stringers.

No stone or iron steps set upon wooden carriages.

No timber used where stone, brick, or iron is commonly used, except wall-plates for roof, bond-timbers, and lintels; such bond-timbers not to exceed 4″ wide and 3′ long. They shall be laid horizontal, and have 18″ masonry between them.

Furring against brick walls shall not exceed 1″ in thickness.

Wilmington: —

Protection for Elevator and Similar Shafts.

Boston: — *a.* Entrance opening in shaft or hoistway within 2½′ above floor shall be protected by sufficient rails, gates, trap-doors or other equivalent device.

b. Every elevator shall be provided with sufficient arrangement to prevent falling of car in case of accident.

c. Overhead elevator machinery shall have beneath it a grille to protect car from falling material.

d. Openings in elevator shaft or hoistway, and through floor other than a stairway, shall be closed when not in use.

e. Inside elevator-shaft openings (except for passenger elevators) shall be furnished with metal-covered doors hung to rabbetted iron frames, with iron thresholds, said doors kept closed when not in use.

f. Outside windows and openings of elevator-shafts shall have three vertical iron bars painted red, equally dividing openings.

g. Every part of elevator not enclosed in shaft shall be protected by wire girdle.

Baltimore: — Hoistway, elevator or well-hole shall have opening on each floor provided with substantial railing.

Brooklyn: — Openings through any floor, except usual stairway, shall be surrounded by a substantial and permanent railing at least 3′ high, or securely closed and fastened at close of each day.

Charleston: — Duty of occupant of building to close and fasten at night all trap-door or other openings, unless substantial and permanent railings enclose openings.

Chicago: — *h.* Doors in elevator-shafts to be of metal, and fastenings upon such door so placed as to be opened only from inside of shaft, and entirely under control of elevator operator. The latches so contrived as to open from outside by means of key. No wood on inside of shafts.

i. All openings without doors shall have metal frames filled with prismatic lights.

j. Elevators may dispense with any shaft whatever where automatic trap-doors are used at each floor, the doors lined with metal on under side, and to close immediately after passage of elevator through that floor, the opening and closing of doors being operated by passage of elevator.

k. Hoistway openings shall have trap-doors covered with metal on under side on all floors, except where elevators are used, with sufficient guards for protection during business hours, and doors kept closed at all other times.

Cincinnati: — *l.* Elevator openings through floors shall be protected by proper rails or gates, or shall be closed by trap-door covered with metal on under side.

Cleveland: — (*l*).

Denver: — *m.* Openings through or upon each floor in which there is hoist or elevator-car not running in shaft shall be protected by sufficient rails, gates, trap-doors or equivalent devices.

(*b*). Outside and (*e*) by springs of sufficient strength.

Detroit: —

District of Columbia: — Lessee, owner or occupant of building in which there are hoistways or other openings besides the ordinary stairways shall have same securely protected by railing or other appliances deemed necessary by Inspector.

Kansas City: — (*f*); (*k*); (*b*).

Every opening into shaft or hoistway shall be protected by sufficient rails, gates or doors, or other equivalent mechanical device.

Every opening other than stairway through floor, or into shaft or hoistway, shall be securely closed at close of each day by occupant or by lessee or owner.

Builders of elevators shall construct same so that all parts shall be easy of access to those in charge, to be approved by Elevator Inspector.

Louisville: — Elevators to be provided with suitable doors at each landing. Doors to be fitted with most approved fastenings. If automatic trap-doors are used, they shall be properly fireproofed on under side at each floor where elevator passes and the elevator-shafts may be dispensed with.

Memphis: — All elevators automatically trapped at each floor, and hoistways shall have close trapped doors.

Milwaukee: —

Minneapolis: —

Nashville: — All elevators shall be provided with automatic shutters at each story, and all "dimensions provided with railing enclosing same."

Newark: — Hoistway on each floor shall be provided with sufficient trap-door, and owner or occupant shall securely close same at completion of each business day.

New Orleans: — Lessee, owner or occupant of building shall have all openings other than usual stairway at each floor closed or protected by railing at least 3′ high, and only opened for passage of merchandise, and closed and fastened at close of each day.

New York: — (*c*), the screen of iron, and immediately below machinery, and of construction approved by Superintendent.

Elevator-shafts shall have suitable openings closed with fireproof doors.

Any hoistway or freight-elevator or well-hole not enclosed in walls of fireproof material, and provided with fireproof doors, shall have openings thereof through and upon each floor protected by substantial railing or sufficient trap-doors to close same, or both, as directed and approved by Superintendent.

Such railings and trap-doors shall be kept closed at all times when not in actual use by occupant having use or control of building.

Omaha: — (*m*); (*b*).

Philadelphia: —

Pittsburgh: —

Providence: — Any hoistway or elevator not enclosed by fireproof partitions and doors, nor placed in well-hole of stairs, the openings thereof through and upon each floor shall be protected by substantial railings or sufficient trap-doors to close same. Such trap-doors kept closed during night, except when in actual use.

St. Louis: — Hatchways or well-holes shall be effectually barred or enclosed by railings, gates or other contrivance approved by Commissioner of Public Buildings, for prevention of accidents.

San Francisco: — Openings upon and through each floor in which there is elevator or hoist not running in shaft shall be protected by sufficient automatic gates or trap-doors, which shall be opened and closed by passage of car. (*b*).

Doors in shafts to be covered with metal on inside, so placed that they can only be opened or closed from inside, and entirely under control of elevator operator.

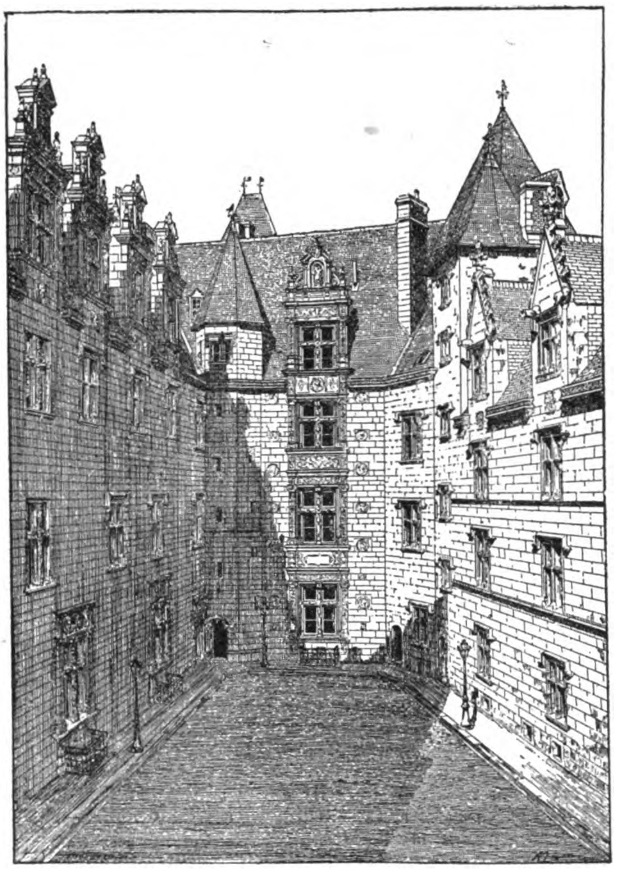
Openings for windows in shafts shall not exceed 3′ by 6′, one window allowed for each story. Frames and sash metal, and glazed with prismatic glass.

Frames and sashes in light walls to be of metal, and glazed with thick glass.

Wilmington: —

Compiled by HENRY A. PHILLIPS.

THE MARCH OF ANCONA.



Cour d'Honneur, Chateau de Pau, France. From *"La France Artistique et Monumentale."*

THE March of Ancona, one of the most fascinating parts of all Italy, is nowadays an unknown land to the tourist. It was not always so. In the days of the stage-coach the road from Bologna to Rome passed through the heart of this district, and many a leisurely "milord" stopped to amuse himself and rest his horses in towns where now the sight of an English face is as sure a "draw" to the children as a dancing bear or a travelling circus would be. The tourist now, after "doing" Bologna in a day, jumps into his express and hurries down to Rome by way of Florence and Perugia, leaving the Marches to the East an unconsidered stretch of land, only to be passed over when necessary with all possible speed in the Indian mail to Brindisi. Æsthetic fashion, too, has followed the track of the most convenient trains, and Perugino and Botticelli receive all the spare enthusiasm of travellers in search of impressions; while Lotto's great masterpieces in the March of Ancona are unknown, and his name, even, is almost forgotten. The oblivion into which this great Venetian painter fell during what may be called the Jesuit period of taste, when the cheap sentimentality of Guido Reni and Guercino was the only thing cared for, can be understood and forgiven. But the man of culture who is "dumb before a Botticelli," or enraptured before a Titian, has no excuse for passing Lotto by, except that Lotto is not yet fashionable.

Lorenzo Lotto was a contemporary and friend of Titian. Already in 1505, the local chroniclers of Treviso, where he lived for a time, spoke of him as "*celeberrimus.*" Browningites know him from his splendid altar-piece in the little village of Asolo. Tourists who are not "personally conducted" have a chance to know him from his portraits in the National Gallery of London, in Berlin, and in Milan, from two exquisite altar-pieces in Venice, and from other pictures in Dresden and Vienna and Rome. But it is only in the March of Ancona that his genius can be really appreciated. Here he came again and again during the active part of his life, leaving beautiful pictures as memorials of his visits; and here, in the middle of the sixteenth century, he retired to pass the end of his life among the monks at Loreto. Thus it happens that Loreto and the little towns in the neighborhood contain his very latest pictures, of which it is not too much to say that their technique is as strong and bold as that of Velasquez or Frans Hals, and their sentiment almost as modern as if they had been in last spring's *Salon*. Sight-seers who grow weary of continual hierarchic Madonnas and saints would, if they knew his pictures, welcome Lotto's originality and humor in interpretation. At a little village called Cingoli, a twenty-mile uphill drive from any railway, there is a splendidly preserved altar-piece by him. The Madonna, as usual, sits enthroned among adoring saints, but Lotto has added, with a touch of his characteristic humor, two little naked angels, who laughingly pelt the worshipping saints with showers of rose-leaves. In spite of the Gothic insel crowns which the priests, with their habitual taste, have seen fit to nail on the heads of the Mother and Child, the sight of this picture is one of the rare artistic experiences of a lifetime. It is absolutely untouched by re-paint, and the colors are as clear and fresh as when the artist put them on, 350 years ago — "*herrlich wie am ersten Tag.*"

The town itself, when once you have climbed up to it, turns out to be worth all the trouble taken to reach it. From the old walls you look out over the hills and valleys to the Adriatic, where more than a quarter of the whole coast-line stretches before you. Urbino lies to the left, the snowy peaks of the Counter-Apennines to the right. In front rises an endless succession of sharp hills, each crowned with its town — so picturesque and so inconvenient — where the Gothic invasions drove the Romans to take refuge from their earlier settlements in the river valleys. No town in Umbria or Tuscany has a view to compare to this; nowhere is landscape more magical. Turning back to the little town, after a first glimpse of the view, it seemed to be positively deserted. I came at last upon one inhabitant who indicated the way to the Piazza, where a man who seemed to be the other inhabitant conducted me to a *locanda* for luncheon. And here I must say, in parenthesis, that in the Marches, more than in any other parts of Italy, you feel yourself in the land where, as Thackeray said, "the *contadino* dances with the *Trasteveriana* in front of a *locanda* to the music of a *pifferaro.*" The luncheon itself deserves mention — eggs, a "beefsteak of veal," fruit and coffee, costing exactly sixteen cents!

The Piazza of Cingoli is no less interesting than many which Baedeker stars in his guides. Here in 1531 a bishop of Viterbo built for himself one of those superb and stately palaces which the Renaissance has left as its richest legacy. Laying aside the Christian humility with which he was supposed to edify his flock, he had his name, and arms, and all his titles, such as Bishop and Patriarch of Constantinople, carved conspicuously over the front of his beautiful palace, that no one might mistake his greatness. There was some love of beauty for itself, no doubt, in the minds of these worldly prelates who have left us so rich a heritage of fine architecture and beautiful pictures (wherein their likenesses as donors are never omitted), but one cannot help suspecting that they knew right well, too, that beautiful things would best perpetuate their memory. Cingoli is by no means the only example in this part of Italy of the advantage of pride in high places. If it were not for Bishop Nicholas Bonafides, Monte San Guisto would be merely a remote wayside village, perched on a steep hill, utterly unknown to the rest of the world. But Lotto's masterpiece is there, — with the bishop's portrait, of course, — and in the Piazza is the magnificent Bonafides Palace, carved all over with the cardinal's hat and the other titles of the bishop, and these two works of art are worth a whole day's drive to see.

Most of the towns of the March, in fact, have more than the usual combination of natural scenery, architecture, and painting, which is the charm and glory of Italy. The palace at Urbino of Duke Federigo Montefeltre — for laymen were not behind bishops — became the model for all Italian courts of the latter part of the fifteenth century, and it is still one of the most beautiful, and by far one of the best preserved, of them all. In the library there is a large Flemish altar-piece, in which an obliging saint is politely introducing the Duke and his son to the Trinity. But more interesting, from an artistic point of view, is the collection, also in the ducal library, of the pictures of Timoteo Viti, Raphael's elder fellow-townsman and first master. Here you see that it was from Timoteo and not from Perugino that Raphael took the sweet oval of the faces of his early Madonnas, and that from Timoteo, too, came that fresh purity and health that is so fascinating in Raphael's young work. Giovanni Santi, Raphael's father, can also be seen at Urbino, and elsewhere in the Marches, — to the disadvantage of his fame. Even his son's greatness cannot make a respectable painter of him!

Another of the towns where art and nature vie with one another in beauty is the village which has grown up at Loreto around the Casa Santa, — the Holy House, — believed by Catholics to have been carried here from Nazareth by angels when it was threatened by the Saracens. About this small one-story house there sprang up an immense church, whose fortified battlements make it look from a distance like a cluster of war towers. The Florentine architect Giuliano di Sangallo crowned it with a mighty dome, which harmonizes with the great hills about it. Within the church, Bramante encased the house in a rich shrine, and the piazza outside is half surrounded by a splendid arcade which he planned. Inside are two cupolas frescoed, towards the end of the fifteenth century, by two of the greater artists of the time, Signorelli and Melozzo da Forti. The works of Melozzo are very rare. In the National Gallery he is represented, as an Irishman would say, by two pictures he did not paint. Outside of his native town there are only some detached frescoes, now preserved in the sacristy of St. Peter's, and this glorious cupola, which in majesty and grandeur can only be compared to Michel Angelo's frescos on the ceiling of the Sistine Chapel. Under this cupola sits, all day long, the active little friar, who, so to speak, "runs the establishment." Around the sides of the wall stretch rows of money-boxes, marked with the names of the different nations, and on his table I noticed, among moneys of many kinds, a number of familiar greenbacks. When he found that I was not prepared to spread his propaganda in the United States he insisted at least upon my accepting a little English book, which, he said, gave scientific proof that the Casa Santa is none other than

the veritable original home of Christ. But rash is the man who calls in science to prove a miracle! I cannot recommend the book as a means of convincing the doubtful. Signorelli's frescos in the adjoining sacristy are almost as wonderful as Melozzo's — mighty figures of prophets and apostles, with a circle of beautiful angels above. They will soon be practically invisible, alas! for the priests have decided to fill with stained-glass the one small window which now lights the room. Even more interesting is the collection close by, in the Palazzo Apostolico, of Lotto's latest works. Here he can be seen as nowhere else, in pictures as harmonious in tone as Whistler's "symphonies," and as strong and free in drawing and brush-work as Degas or Monet.

At Recanati, a six miles' drive from Loreto, there are more Lottos still to be seen. But the visit of a stranger was so unexpected an event that the first time I drove there I was unable to see the pictures. The librarian had gone away for the day, taking the keys of the *pinacotheca* in his pocket. A considerable part of the population gathered about to express unavailing sympathy with my indignation and to try to beguile the time by showing me memorials of Leopardi, their poet, and of Mr. Gladstone, who wrote an essay on Leopardi (in his "*Gleanings from Past Years*") and sent them several autograph letters, now piously preserved. The Lottos, however, were visible only upon a second visit, due warning having been sent this time to the librarian, the mayor and the town secretary. At Jesi, too, a town lying somewhat to the north of Recanati, there is a fine collection of pictures by Lotto in the library, which was once a church. Here, again, it is important to warn the librarian of your visit, or the chances are you will have to content yourself with gazing at the empty churches where once the Lottos were, and where guide-books, without danger of contradiction, still locate them.

In mentioning the pictures by Lotto I have not begun to exhaust the list of great paintings to be seen in a journey through the March of Ancona. In the most out-of-the-way places one is as likely to come upon a masterpiece as in more important towns, such as Pesaro and Ancona, which possess well-known altar-pieces by Giovanni Bellini and Titian. In Arcevia, for instance, a small village many miles from even such a tiny town as Sassoferrato, there is one of Signorelli's most important works, and in San Severino a large "Ancona," signed and dated, by Niccolo da Foligno. Until recent times most of the splendid Crivellis now in the National Gallery were in the churches a little to the south of this district; now, unfortunately, few of his works are to be found, at any rate until you get as far south as Ascoli, where he lived. Still there is always the exciting possibility of coming upon some unnoticed work by him in a remote corner, an adventure which actually happened to me in the sacristy of a small church in an inaccessible little town called Pausola. Some seventeenth-century painter had had the brilliant idea of surrounding Crivelli's severe and quiet Madonna with simpering naked angels, but he could not succeed in hiding the beauty of the original picture, any more than a fashionable dressmaker can succeed in hiding a really beautiful woman.

The feeling of discovery adds a certain charm to this region. You can never be sure that the writers of guide-books have really been everywhere; in fact, you strongly suspect at times that their information is largely hearsay. —*M. W. in the New York Evening Post.*

BOOKS AND PAPERS

THE "*Life of Michelangelo Buonarroti,*" by I. Addington Symonds, in two volumes, crown octavo, gilt tops, extra cloth, with illustrations, is brought before the world in a mass and a manner for which, it is to be assumed, there were sufficient mercantile reasons. Not more than 900 pages — 450 leaves — with liberal spacing and margins, are accommodated luxuriously in a bulk of 230 cubic inches, weighing seven pounds avoirdupois. What have readers done — to say nothing of purchasers — to be so over-burdened? The illustrations, it must sadly be said, are not of such uniformly superior quality as to justify an excess of dimension; otherwise, binding also being taken into consideration, the volumes might fall indulgently into the list of

> "Such with their shelves as due proportion hold,
> Or their fond parents dressed in green and gold,
> Or where the pictures for the page atone,
> And Quarles is saved by beauties not his own."

This, however, is not a quotable instance of escape from wreck, *de planche en planche.* An ambitious life of a great man — surely of a great artist — is bound to be a work of art. When materials are sufficient, as in the present case, we expect a worthy presentation of the life and the life-work of the subject — in this case, of the personal character of Michelangelo, and the characteristics of his productions in painting, sculpture and architecture. There is no need for uncandid suppression of shortcomings or demerits. Boswell has taught the world how weaknesses can be put on record without disgracing the fundamentally noble; without putting blemishes and blotches into the highest lights; or, what is even worse, turning virtues and excellences into vices and absurdities by driving description of them precisely over that perilous edge of exaggeration which it was their conspicuous merit to have skirted in security.

Leaving aside Mr. Symonds's appreciation of the personal characteristics of him whom Sir Joshua reverentially styled "that truly divine man," it must suffice here to indicate what measure of deference his works are treated with, and how far those who are acquainted with them may turn to these pages for sympathy; and what encouragement is ministered to those who at present are not to anticipate what some have regarded as the greatest opportunity of their lives.

"The David, to state the matter frankly, is a colossal hobbledehoy. . . . The head of David is too massive and the extremities too largely formed for ideal beauty. . . . He wants at least two years to become a fully-developed man." An objection to the "close observance of the imperfections of the model at a certain stage of physical growth" is as rational as a regret that the legs of a foal are so disproportionately long as compared with its mother's. In this, as in a succession of cases, damning criticism is only rendered more absurd by association with inconsistent saving-clauses in terms even of enthusiasm.

Of the Sistine ceiling we read: "Michaelangelo has betrayed the inconsequence of his invention. It is clear that between the architectural conception of a roof opening on the skies and these pictures of events which happened on earth there is no logical connection. Indeed, Michelangelo's new system of decoration bordered dangerously upon the barocco style, and contained within itself the germ of a vicious mannerism." At the foot of the same page we have to step, without stumbling, if we may, upon this sudden contrast: "The vault of the Sistine does not strike the mind as being artificial, or worked out by calculation, but as being predestined to existence, inevitably, a cosmos instinct with vitality" (p. 241). And yet we are told of "the inconsequence of the invention."

On the "Moses": "We may even be repelled by the goat-like features, the enormous beard, the ponderous muscles and the grotesque garments of the monstrous statue. . . . Condivi does not seem to have felt the turbulence and carnal insolence which break our sense of dignity and beauty now."

Of the "Risen Christ of the Minerva": "Could this brawny man have ever suggested any distinctly religious idea? Christ, victor over Death and Hell, did not triumph by ponderosity and sinews. . . . Substitute a scaling-ladder for the cross, and we have here a fine life-guardsman, stripped and posing for some classic battle-piece. . . . Those vulgarly handsome features, that beard pomaded and curled, etc., etc."

The "Last Judgment": "A puzzling work, at once fascinating and repellent; a collection of athletic nudes, — the total scheme of congregated forms might be compared to a self-deafening solo on a trombone. The picture is terrifying, dreadful in its expression of wrath, retaliation, thirst for vengeance, cruelty and helpless horror. . . . The angels with the symbols of the Passion are 'wrestling angels,' demonic angels tumbling in clouds like Leviathans. . . . The hosts of heaven are adult and over-developed gymnasts. Christ is portrayed 'as an angered Hercules hurling curses upon helpless victims.'"

Again, "Still the breath of life has exhaled from all these bodies, and the tyranny of the schematic ideal of form is felt in each of them. Without meaning to be irreverent, we might fancy [are we to suppose, consistently with reverence?] that two elastic lay figures, one male, the other female, both singularly similar in shape, supplied the materials for the total composition" (p. 1281).

"He even exaggerates what is masculine in the male as he caricatures the female by ascribing impossible virility to her" (p. 275).

We are called on to endure the reading of the like of this in regard to the sculptor of the "Pietà" of St. Peter's: "The only reason why his transcripts from the female form are not gross like those of Flemish painters, repulsive like Rembrandt's, fleshy like Rubens's, disagreeable like the drawings made by criminals in prisons, is that they have little womanly about them."

Of a cartoon of a Bacchante at Naples it is said: "An athletic circus-rider of mature years, with abnormally developed muscles, might have posed for this female votary of Dionysus" (p. 1276).

Yet we might bear this, too, — well, very well, — but the feeling evoked by such a criticism as the following of the awakening female figure of the Medicean chapel deserves only such an epithet as the pen refuses to write down, the tongue to pronounce:

"The 'Dawn,' again, in her deep lassitude, has nothing of vernal freshness. Built upon the same type as the 'Night,' she looks like Messalina dragging herself from heavy slumber, for once satiated as well as tired, stricken for once with the conscience of disgust." It seems as if the very spirit of the Roman past might rise up to protest against the misapplication of his honest, indignant satire to such shameless profanity.

But even worse is behind: "At best," he says, "Michelangelo's women carry us into the realm of Lucretian imagination," and, in explanation of what this would import, the evoking "images tallying to the vision of primal passion in the fourth book of the Lucretian epic," he transcribes from one of his former publications an elaborated paragraph which was anything but welcome there. He might well have foregone the temptation of indulging himself at the expense of nauseating his readers by returning to his transliteration of those sections which it was the shame of Dryden, in his latest years, to have come back eagerly to wallow in.

All this is very pitiable, and the more so as in an earlier work,

"*The Renaissance: Fine Arts,*" Mr. Symonds has, however, succinctly given a far more sympathetic and far more just appreciation of the mighty Florentine. To this work, indeed, he sends the possessors of the present bulky life — and that is scarcely fair — for the completion of his critical survey of the Sistine ceiling.

This "life" helps us to little, if any, knowledge of its subject which is not obtainable with less alloy elsewhere. In some points, especially as to the relations of Michelangelo and Vittoria Colonna, it is very misleading. The interpretation of the drift of a letter of the Marchesa shows ignorance, which is extraordinary in such an Italian student, of her difficulties as a member of the suspected *sodalitium* of Cardinal Pole in relation to the Inquisition.

W. WATKISS LLOYD.

PEOPLE who undertake to write books on technical subjects do not always remember that their work loses much of its usefulness if it does not cover its subject completely, so that those who consult the book for information may always be sure of finding what they want. The Germans understand this principle, and German technical books, although sometimes so detailed as to be rather exasperating to a reader not specially concerned with the subject of which they treat, are pretty sure to contain all that is to be known on that subject. In the present instance,[1] Mr. Berg has undertaken to treat an important, if not very attractive, topic in the German manner, and from a watchman's shanty, or a section tool-house, to a great union or terminal passenger-station, there is no type of building connected with railway operation which is not intelligently discussed, and copiously illustrated, in what is necessarily a book of liberal dimensions. For the architect who, naturally, would rather concern himself with the more important classes of railway buildings, there are descriptions of two hundred and ten passenger-stations alone, explained by two hundred and seventy-two plans, elevations, sections and perspective drawings. From these, accompanied, as they are, with such observations and suggestions as only an intelligent railroad-man can give, an architect can form in two hours a clearer notion of what is needed in a design for such a building than he could by a week of effort to evolve a railroad station from the depths of his moral consciousness, which is all that most architects have to rely upon for suggestions in such matters. Even the specifications are given for several passenger-stations actually built, thus furnishing an important additional guide to the architect to whom, as to most architects, this special class of work is unfamiliar. The remaining buildings, such as snow-sheds, engine-houses, freight-stations, and so on, which are treated with minute care in the book, come much less frequently under an architect's care; but the descriptions of them are interesting, and, in a way, valuable, even to an architect, as adding detail and clearness to his conception of the conditions to be met, and the precautions to be observed, in every kind of railway structural work.

AMONGST the many periodicals which undertake to treat of building and architecture which have appeared during the last twelve months, the *Journal of Architecture* is the only one which seems to have a distinct purpose, apart from producing for its promoters more or less of an income from the advertisements of dealers in building-materials and appliances, — not that the promoters of this little publication despise or neglect this source of income, but, on the face of things, it is evident that the Philadelphia Chapter A. I. A. derive an income from the advertising field, not for the sake of a profit, but merely to procure an income which will support their undertaking. To what further length the Chapter may be induced to go on finding an increasing income might enable them to expand their undertaking, we cannot guess, but at present they confine themselves to offering a useful and desirable lesson in the several styles of architecture. Each number has contained five or six plates which illustrate, so far as so limited a number will allow, some feature of one of the Classic styles, and the lesson so presented is enforced by accompanying these plates with a single example of a modern building which illustrates the same subject. Thus the façade of the Philadelphia Custom-house illustrates the modern use of the Greek-Doric, while the Propylæa at Munich illustrates it in the next issue, and the façade of Girard College and the front of the Old Exchange, Philadelphia, show modern instances of the Corinthian order.

This purposeful undertaking of the Philadelphia Chapter is made-up in a small octavo form and printed in an attractive manner both as to plates and text, which in a more or less successful manner supports the lessons suggested by the plates.

The editors seem to have forgotten how frequently architects dissociate plates from their accompanying explanatory text, and they would do well, we think, to add full titles to the plates in future. And as the Propylæa at Munich is spoken of as "one of the most scholarly and artistically successful examples of the so-called classic revival period of modern architecture," it surely would have been no more than fair to mention Leo von Klenze's name in connection with it.

THE MORMON TEMPLE. — The new Mormon Temple will be dedicated at Salt Lake, April 6. The construction of the building was begun forty years ago, and it has cost $2,500,000. — *Salt Lake Tribune.*

[1] "*Buildings and Structures of American Railroads.*" A reference-book for railroad managers, superintendents, master-mechanics, engineers, architects and students. By Walter G. Berg, C. E., principal assistant engineer, Lehigh Valley Railroad, New York; John Wiley & Sons, 53 East Tenth Street, 1893.

SOCIETIES

REPORT

WORCESTER CHAPTER OF THE AMERICAN INSTITUTE OF ARCHITECTS.

THE regular monthly meeting of the Worcester Chapter of the American Institute of Architects was held at the Worcester Club last week. Dinner was served at six o'clock. Business of a local nature was transacted.

ENGINEERS' CLUB OF PHILADELPHIA.

THE secretary read five letters that had been received, expressing the opinions of their writers as to whether papers should be given to engineering journals before they had appeared in the Proceedings of the Club, four of which were opposed to such action, while the fifth favored it.

The general opinion was that the Proceedings should be issued promptly, in order that the papers might appear as soon after they had been read as possible, and that simultaneously with their appearance in the Proceedings they might be given to the technical journals.

The president referred to the varying practice of the national organizations of civil, mining and mechanical engineers, which print all papers and issue them to members prior to, or immediately after, presentation. These papers appear in pamphlet form, subject to revision, and are accompanied by the discussions when possible, but additional written discussion is also permitted. The mining and mechanical engineers also issue the revised papers and discussions in annual volumes.

Dr. Henry Leffmann presented the paper of the evening on "The West Sterilizer for Water and Milk," illustrating his remarks by the projecting lantern and by means of the apparatus itself.

He considered the application of heat the best method of sterilization. A temperature of 212° F. will accomplish this if long continued; higher temperatures (say 240° F.) produce very rapid destruction of all living organic matter. The employment of this method is, however, generally inconvenient and expensive. Moreover, if water be boiled in an open vessel not only is it impossible to get the temperature above 212° F., but the dissolved gases are expelled, rendering the water flat and vapid; and in some natural waters much mineral matter is deposited. Boiling in closed vessel requires care, unless a perfectly automatic and continuous method be devised.

The West sterilizer is so constructed as to permit the continuous heating of water intended for drinking purposes to temperatures from 212° to 250° F., thus including temperatures amply sufficient to destroy all infection. The heating is done in closed cylinder provided with an automatic valve, by which water will not be permitted to pass to the storage-chamber unless the proper temperature is maintained. If by any change in the condition of the supply or source of heat the temperature of the sterilizing-chamber sinks below that at which the valve has been set the valve closes and water ceases to flow. It is thus impossible to pass unsterilized water to the storage-chamber. The automatic valve can be set at a desired temperature. The heating taking place in an entirely closed vessel does not deprive the water of its gases.

AMERICAN INSTITUTE OF ARCHITECTS.

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R. M. Upjohn, New York, N. Y., and the Presidents of the several Chapters.

COMMITTEE ON COMPETITION CODE.

C. E. Illsley, St. Louis, Mo.; J. W. Yost, Columbus, Ohio; J. G. Cutler, Rochester, N. Y.

SPECIAL COMMITTEES, 1893.—ON REVISION OF CONSTITUTION AND BY-LAWS.

Geo. B. Ferry, Milwaukee, Wis.; C. E. Illsley, St. Louis, Mo.; R. W. Gibson, New York, N. Y.

ON REVISION OF SCHEDULE.

W. G. Preston, Boston, Mass.; W. W. Clay, New York, N. Y.; W. C. Smith, Nashville, Tenn.

ILLVSTRATIONS

[*Contributors are requested to send with their drawings full and adequate descriptions of the buildings, including a statement of cost.*]

HOUSES ON NORTH STATE ST., CHICAGO, ILL. NO. 485, HOUSE OF A. SANBORN, ESQ., MR. CHARLES S. FROST, ARCHITECT. NO. 483, MR. F. B. TOWNSEND, ARCHITECT, CHICAGO, ILL.

[Helio-chrome, issued with the International and Imperial Editions only.]

SKETCH FOR A COUNTRY HOUSE BY MR. RICHARD WILLIAMS, BRIDGEPORT, CONN.

HOUSE OF W. K. BIXBY, ESQ., ST. LOUIS, MO. MR. W. ALBERT SWASEY, ARCHITECT, ST. LOUIS, MO.

THIS house is built of light-yellow Roman brick, with terra-cotta finish of a golden-brown. The roofs are covered with red Vermont slate.

HOUSE AT WELLESLEY HILLS, MASS. MR. WARREN A. RODMAN, ARCHITECT, BOSTON, MASS.

STABLE AND AMBULANCE-STATION FOR THE CITY HOSPITAL, BOSTON, MASS. MR. E. M. WHEELWRIGHT, CITY ARCHITECT, BOSTON, MASS.

HOUSE FOR DR. C. A. HERTER, 819 MADISON AVE., NEW YORK, N. Y. MESSRS. CARRÈRE & HASTINGS, ARCHITECTS, NEW YORK, N. Y.

[Additional Illustrations in the International Edition.]

OSSUARY AT SIZUN, FINISTERRE, FRANCE.

WE reproduce from "*L'Encyclopedie d'Architecture*" a view of the ossuary which is placed at the side of the triumphal arch which serves as the entrance to the cemetery adjoining the church at Sizun, Finisterre. This kind of building is quite numerous in this portion of Brittany. They serve to store the bones withdrawn from sepulture after time has expended upon the corpse its office of decomposition. The necessity of these exhumations may be conceived in view of the fact that within the cemetery confines, usually sufficiently restricted in area in the neighborhood of the church, it is continually necessary to provide free space for new burials. Now, these little monuments always form, together with the triumphal arch by which entrance is had to the "God's-acre," together with the calvary which decorates the centre of the enclosure and the parish church, situated at varying distance, a decorative *ensemble* whose originality and poetic grandeur cannot be imagined when it has not been seen. In these kinds of necropoles the Breton artist displayed the masterly qualities of the experienced decorator and a consummate knowledge of effects and the poetical feeling which attracts and retains the attention. One must see these necropoles and visit these monuments to be able to thoroughly appreciate our thought and share the feelings of wondering emotion which they cause to spring in the mind of the artist and the imagination of the poet. The reproduction is powerless to embrace at the same time all the space included within the absolutely theatrical view which one has before him, as, standing in the centre, he turns his eyes from point to point of this marvellous decoration, and consequently can give only an incomplete idea of it. Still, it does fair service in enabling us to trace the detail, and to draw from the study of this interesting composition a precious lesson. The ossuary at Sizun, like the triumphal arch at the same place, dates from the second half of the seventeenth century. It would seem rather to date from the last years of the sixteenth, for in the character of the sculpture and the mouldings it partakes much more of the architectural work of the reign of Henri II than of that included in the time of Louis XIV. The rational traditions of the Middle Ages are here manifest, although evidently altered by the existence of a preconceived idea which caused the adoption of a form derived from antique *ordonnances* rather than from some other which had no other origin than the necessity of satisfying a requirement. Nevertheless, the work is judicious as a whole, and far from being illogical in the study of its details. The construction is good and correctly indicated, the decoration is rich and brilliant without heaviness or pretentiousness. The slate roof presents a curious instance of a cresting which is even to-day still used in this region, and which certainly must date back to a remote time. In place of having recourse to lead, which, doubtless, was too expensive, the Breton builders have ever preserved the custom of laying the last row of slates upon each pitch so as to pass one another, each slate being laid at an angle, so as to form an inclined cresting, having the form of saw-teeth. Sometimes these teeth were perforated with open-work, devised after some geometrical pattern. Here the slates have been skilfully cut in *fleurs-de-lis*, and when the cresting was in good condition it must have produced an agreeably decorative effect. Unfortunately, there now survive only a few remains of this work, which, however, allow the observer to take account of the process, at once decorative and constructive, which, although primitive, is none the less very curious.

CHURCH OF ST. THEGONNEC, FINISTERRE, FRANCE.

ANOTHER plate gives a view of the tower of the Church of St. Thegonnec, a little town in the environs of Landivisiau, Finisterre. This township possesses a complete and remarkable collection of the different edifices which constitute a Breton necropolis—triumphal arch, calvary and ossuary, this last with a fine crypt in which a group of life-sized figures represents the entombment of the Saviour. The church was rebuilt last in the seventeenth century, and the highest tower, which only our view shows, dates from 1605. The arch and the ossuary are seen in the foreground of this view. The first dates from 1587, the second, attached to it and forming with it a homogeneous whole, dates, nevertheless, only to 1677. A little farther off we see the calvary (1610), whereon are a countless number of statuettes, representing the principal episodes of the Passion. The beauty and amplitude of this decorative spectacle exceeds description, but one thing that is curious to remark is its incomparable originality, so to style the eccentricity of the good quality of these forms, which have nothing in common with the architectonic conceptions of the same epoch in any other part of France. These pylons, their crowning features, and the attachments which buttress them, somewhat recall the ediculæ which front the Hindoo pagodas, and cause one to think of Cambodian art. If it were not for the cross which surmounts them, one might rather believe he found himself in the presence of some building erected at Cakya-Mouni than before the exterior enclosure of a Christian necropolis. The influence which the preconceived system of antique orders might have exercised over this work, erected in the middle of the reign of Louis XIV, when the fiat went forth from north to south, from east to west, to systematically clothe all buildings in a skin of Roman art,—this influence, we say, nowhere reveals itself. And if the system of moulding smacks, although very indirectly, of the manner followed in antique art, the rôle that it plays in the general conception is sufficiently effaced, for this reappearance of the past, become the fashion of the moment without serious reason, not to exercise any unfortunate action on the marked individuality of the work. Like his mediæval predecessor, the Breton architect of the seventeenth century knew how to show here that he understood the subordinating of difficulties and the suppleness of form to the exigencies of the

material which he had to use. A lantern which surmounts the tower and the four smaller belfries which buttress it, though having the mass of those ediculæ of the kind erected elsewhere during the Renaissance period, are not at all similar to those of the monuments of Touraine. The weight of their lines and the simplicity of their masses denote a manner of conception that is very broad, a method of creation which is entirely healthy. Here, still and always, the form is the result of the need, the consequence of the thought and not the product of a preconceived system based on the factitious exigencies of an irrational and valueless sentiment. It is good and healthy architecture, because it is independent in its principles, in its means and in its ends. They do not build like this to-day in this same region, and everybody regrets it, except, perhaps, the Academy, which is the cause of it.

INTERIOR VIEW OF THE CHURCH OF THE ROSARY, LOURDES, FRANCE. M. HARDY, ARCHITECT.

CHURCH OF THE ROSARY, LOURDES, FRANCE. LATERAL VIEW SHOWING APPROACHES. M. HARDY, ARCHITECT.

CHURCH OF THE ROSARY AND THE BASILICA, LOURDES, FRANCE. GENERAL VIEW. M. HARDY, ARCHITECT.

THIS and the preceding two plates are copied from *L'Architecture*, from which we reproduced other views and a very interesting description in our issue for January 28.

"THE FALL OF BABYLON," AFTER THE PAINTING OF M. GEORG ROCHEGROSSE.

A DESCRIPTION of M. Rochegrosse's great painting, "La Mort de Babylone," which was exhibited at the *Salon* of 1891, was published in the *American Architect* for June 20, 1891. This plate is copied from *Zeitschrift für Bildende Kunst.*

BACKFORD CHURCH REREDOS. MESSRS. DOUGLAS & FORDHAM, ARCHITECTS, CHESTER.

WE devote a page to the illustration of this design, because of the excellent quality in detail which it exhibits. The general form of this reredos is governed by the necessity of hiding as little as possible the memorial window behind. The work has been very admirably carried out. On one side is shown our Lord with the cross, and on the other after the Resurrection; the canopies for the candlesticks and cross have decorated diaper backgrounds. The wall-space flanking the reredos on either side is hung with a rich fabric. The whole work is a memorial to Mrs. Mary Taylor, who died at Mollington, August, 1891, by her husband and sons. The altar-cloth and window suggested are suppositions. The plate is copied from the *British Architect.*

"THE SEASONS," DESIGNED BY W. S. BLACK.

THIS frieze-paper design, illustrative of "The Seasons," has been executed by Messrs. Jeffrey & Co., of Islington, and is introduced as a single-print monotone paper. It is so arranged that the hanger may be able to trim his paper without cutting through any of the actual design. The aim of the designer has been well realized in producing a background paper which is full of interest, while the figures are sufficiently subordinated so as not to be too obtrusive. The frieze is adapted for use with any single-print paper in combination. The joint in the hanging of the wall-surface paper follows the wavy line which divides the scroll pattern enclosing the figures. The sample, in reds, which we have before us, furnishes certainly a warm and well-conceived example of decorative design. Our illustration was prepared from a specially-printed black-and-white impression. Among the other papers issued for the forthcoming season by the same firm are several of novel and conspicuously attractive merit. In what we may term the "specially artistic" class is a tulip paper by Mr. Heywood Sumner, treated in very quiet monotone colorings. A brilliant and excellent piece of printing is to be noted in the frieze of birds and flowers by Mr. C. A. Voysey, whose paper, called the "Isis," in transparent greens and blues, is strikingly original and clever in drawing. Mr. Lewis F. Day's "Vatican" design, and "The Buckingham" by Mr. H. W. Batley, are handsome and well-designed all-over patterns, which in execution have received the utmost care in their several renderings in bold as well as delicate tints, to meet a considerable variety of locations. Some new ceiling-papers make up the series, added to which are machine-made papers of great variety. The plate is copied from the *Building News.*

WEST END BRANCH, CREDIT LYONNAIS, COCKSPUR STREET, LONDON, S. W., ENG.

IN designing a bank for this great financial company, it was fitting that French Renaissance should be employed. Everybody assumes that architecture, as many other things, is better managed in France than among us, but we imagine that the directors of the Crédit Lyonnais would be the first to acknowledge that Messrs. Davis & Emanuel have been as successful as any of the numerous French architects who have been employed to erect banks and offices for the company.

THE CATHEDRAL, MAYENCE, GERMANY.

WE have to apologize to many correspondents who have written to us complaining of the delay in the publication of Prout's drawings. As we explained on a former occasion, there are many causes which interfere with the regular production of the parts of a series in a journal like this. As the whole of the plates are now on stone, subscribers may be confident that they will receive all the examples of Prout's works, which we have undertaken to produce.

NEW PREMISES, LLOYDS BANK, LIMITED, BEXHILL-ON-SEA, ENG. MR. ARTHUR WELLS, F. R. I. B. A., ARCHITECT, HASTINGS.

THE arrangement of the bank is shown on the ground-floor plan, above which is the manager's residence, with private and back entrances. The upper part of the building is set back by reason of the estate regulations as to the building-lines. The building has been constructed of local red bricks; the roof is covered with Elterwater (Westmoreland) green slates, and the doors and sashes to the banking-room are of polished teak.

COMMUNICATIONS

[*The editors cannot pay attention to demands of correspondents who forget to give their names and addresses as guaranty of good faith; nor do they hold themselves responsible for opinions expressed by their correspondents.*]

CELLAR OR NO CELLAR?

BOSTON, MASS., February 13, 1893.

TO THE EDITORS OF THE AMERICAN ARCHITECT:—

Dear Sirs, — In conversation many years ago with the late Dr. Agnew of New York, of highest authority on hygiene, he told me that he thought that, for sanitary reasons, there should be no cellar under any dwelling-house. If there were, he remarked, the floor above should be most carefully sealed against the passage of any cellar-air into the house, while the entrance to the cellar should be wholly outside the house. This was in the beginning of my practice in dealing with the construction of factories, and it became one of the motives, aside from safety and economy, in treating the subject of the basement-floor.

I now venture to put a question which has become of considerable practical importance to architects: Ought there to be a cellar, in the ordinary sense in which that word is used, under the occupied parts of buildings of any kind, such as schoolhouses in which children are taught, factories in which men and women work, lower stories or basements of houses where much of the household work is done? In other words, ought not the lower story of almost every building to be put on well-drained ground above grade, both with a view to economy in construction, and for sanitary reasons if for no other?

In factory practice all types of basement-floors built of timber and plank placed a few feet above the ground, in an excavation or even at grade when not open to the air on every side, with the expectation of ventilation beneath, have failed. It may be alleged that it has proved to be impracticable to ventilate a mere air-space under a basement-floor of a large building over the ordinary gravel or hard-pan of the soil, so as to prevent the decay of timber. In the best mill practice excavated basements or cellars, half to two-thirds under ground, with cemented floors of concrete, have been sufficiently well ventilated; but that type of construction makes an expensive underground-story, of which, as a rule, but a small part can be put to effective use. It is apt to cost as much or even more by the square foot of floor than any other floor-surface in the factory.

On the other hand, in many workshops and in some factories it is very desirable to be able to set machinery as nearly as possible upon the solid ground with timber and plank interposed between the ground and the machine, since, for many reasons, machinery may not be placed directly on concrete. This has been safely accomplished by making the concrete over a well-drained floor-space with asphaltum or coal-tar in place of cement. Timber and plank laid in cement will rot very speedily and a cement concrete is a quick conductor of heat. An asphaltum or coal-tar concrete properly laid is a non-conductor of heat, an antiseptic, and is impervious to moisture; upon such a surface timber and plank laid solid last as well as in any other part of a factory building.

Under these conditions, the question arises, May not expensive basements or cellar-stories be done away with, except so far as it is either cheaper or more convenient to make an excavation for absolute use and not merely for the purpose of interposing a partly underground story beneath the main floor of a building?

In dealing with the condensation of moisture on interior surfaces, absolute success has been attained in preventing such condensation

even over the Fourdrinier or the cylinder machines in paper-mills, from which the maximum quantity of humidity is discharged in the process of converting wet pulp into dry and finished paper. Composite roofs made of proper materials six to seven inches thick have proved to be absolute non-conductors of heat, cold and moisture, and in their application to these machine-rooms, with proper ventilation to remove the steam, the condensation of moisture on the under side has been wholly done away with.

Reverse this process: May we not put a composite floor underneath the lower story of a building, reversing the order of materials which are used in the roof, and in this way put an absolute non-conductor of heat and moisture between the first occupied room and the well-drained soil below this composite floor? Why not? Many examples can be cited of complete success in this practice, which is now becoming common in our lines.

The following conversation occurred between myself and a very practical man not long since, in the discussion of a building in which he desired to put all his main work on a single floor. On my suggesting this method of construction, he said, "Oh, but I must have a cellar! It would not be fit to build such a building without a cellar."

"Very well," I replied, "then we will put a cellar under your main floor. You will desire to floor your cellar, will you not?"

"Certainly."

"What will you floor it with?"

"Cement or concrete."

"Would it not be better to use coal-tar or asphaltum?" explaining the reason.

"Certainly," said he, "we will adopt that floor."

"Then," said I, "you had better have a light cellar, had you not? You can afford to put your main floor considerably above grade for your purpose."

"Oh, yes, light by all means!"

"Shall we put it half-way out of the ground?"

"Yes, as much as that."

"Good!" said I. Next I asked, "But where you propose to put this building will it not cost you a great deal more to excavate than it would to keep up well toward the surface?"

"Yes," he replied: "Very hard place to dig."

"Then," said I, "suppose we put the cellar two-thirds above ground."

"Well," he replied, "why not?"

"Now, then," I said, "you have just back of your location a good gravel-bank: wouldn't it be a good deal less costly to grade up a foot and drain well than it would be to dig any hole of any kind?"

"Why, certainly," said he.

"Then," said I, "why not put your cellar-floor one foot above grade and drain it well?"

"Why," said he, "what has become of my cellar?"

My reply was, "You have put it in the best place possible, with the floor one foot above ground, and that cellar, wholly above ground, being placed under your main floor, will cost you less than it would to dig a great hole in the ground in which you will generate foul air and accumulate rubbish."

"But," said he, "you have given me a two-story building with two floors, and that is double the floor-space that I want."

"Yes," I replied, "I have given you a two-story building with two equally useful floors at less cost than you would have put into a one-story building with a deep and almost useless cellar under it. What are you going to do about it? Will you waste your money by digging a hole in the ground?"

"No," he said.

"Well, what will you do?"

"Why!" said he, "why can't I leave out the upper story and bring the roof down so as to cover-in the first story?"

"Well," I remarked, "why not? I think you have landed where I meant you should. If you can cut off the passage of heat, cold and moisture by properly constructing a composite floor directly upon well-drained ground, why do you want to dig a hole underneath it, at heavy cost?"

"But," said he, "I meant to store my coal in the cellar."

"Well," I said, "you can dig a hole for your coal if you want to: put it down in the hole in order to go through the work of bringing it up again. Why not put it in a shed in the rear on the level of the floor where you use it?"

"But," said he, "I meant to have put my sanitary appliances down below."

"Then," said I, "you would probably have made your cellar a great deal more foul than it would be under ordinary conditions. Better put them outside, for every reason, whether you have a cellar or not."

My practical man thought he had found for himself an excellent method of getting the room he needed on one floor at about three-fifths or perhaps one-half of what he expected it would cost him on his own plan for one floor and cellar. Yet there are still many persons who think that they must have a cellar under the main floor.

To what extent can such persons be persuaded to build their cellars wholly above grade by at least one foot?

In other words, the question put to architects and, through them, to owners, may well be, If you have no use for a cellar, why put one under your building? A building costs a certain sum by the unit of the square foot of floor, counting every floor. If the use of only one floor is called for, why put a more expensive floor ten feet below it by digging a hole in the ground?

If it is expedient to use two floors and to have all the light, air and ventilation one can get on both, why make one a basement partly below ground and partly above? Why not put them both above grade?

Of course these questions apply to open spaces where it is not necessary to go down deep into the bowels of the damp earth or high up into the air in order to get floor-space. On a broad area floor-space on one floor can be provided at less cost than by excavating or going high into the air; on two floors at the lowest cost at which floor-space can be provided in any way.

Then why provide either cellar or basement floors below grade except in deference to a superstition derived from a period when the right way of constructing a floor directly upon the ground had not been devised? EDWARD ATKINSON.

ONE CLUB AND THREE ARCHITECTS.

SARATOGA SPRINGS, N. Y., February 9, 1893.

TO THE EDITORS OF THE AMERICAN ARCHITECT: —

Dear Sirs, — They propose building a Gentlemen's Club here in Saratoga Springs, N. Y. Three architects have presented plans for same; they have also submitted estimates from responsible builders.

When the Club met to decide on one of the three a resolution was passed, as follows:

"*Resolved*, That before the Club adopts any plan for a building it requires from the architect presenting a plan a certificate valid in lieu that the building when completed according to the plans so presented shall be a completed building suitable for the occupancy of the Club."

Will you kindly tell me through the columns of your valuable paper if architects are ever called upon for such as called for by the above resolution?

Yours respectfully, "A SUBSCRIBER."

[SUCH ridiculous propositions are sometimes made to architects, but we never heard of an architect of any reputation in the profession who acceded to them. EDS. AMERICAN ARCHITECT.]

NOTES AND CLIPPINGS

THE PERILS OF REFEREESHIP. — A singular lawsuit with an unexpected ending is that lately tried in Paris against the sculptor Jacques France, whose real name is Paul Lecreux, for trying to assassinate Binot de Villiers, the referee in a suit against the sculptor for selling the same thing to two different publishers. He and Charles Gautier got up a popular bust called "The Republic," and France sold the right of reproducing it by lithography to two different publishers. When M. Binot, as referee, decided against him as to the second sale, the sculptor sought him at his office, fell upon him and nearly killed him. What made the attack worse was the circumstance that France, before attacking the referee, asked another man in the office to go outside. Then he struck Binot twenty blows with a sculptor's bezel. At first France acknowledged that he intended to kill his man, but on the formal trial boasted of his physical strength, and maintained that he did not wish to kill him, though it would have been easy. Strange to say, the jury at the Cour d'Assizes acquitted him. His victim, having entered suit in the Cour des Débats, had the barren satisfaction of winning damages to the extent of one franc. Juries are getting strange reputations for absurd verdicts in other countries besides ours. — *New York Times.*

A TIMBER FLUME AT FRESNO, CAL. — The county of Fresno, Cal., boasts of a flume fifty-two miles long, built of timber throughout and designed for conveying lumber from the place of felling in the Sierra Nevada Mountains to the plains below. In section, the flume is V-shaped, the angle being 90 degrees; the V is 21 inches deep and for the most part 3 feet 7 inches across the top, this width being increased, however, at various points, where a decrease in the grade necessitates a larger volume of water to carry the timber, the lower terminus being 5 feet 4 inches wide by 31 inches deep. The main supply of water is received from a lake near its head, but four additional feeders are led into it at different points along its length. The sides of the flume are constructed of 1 1-4-inch boards, and the structure is carried on trestle-work for nearly the whole length, these trestles being as many as 130 feet high in some of the deep cañons crossed by the flume. The steepest grade is one of 1,200 feet to the mile, maintained for about 3,000 feet. — *New York Sun.*

DEFECTS IN TIN-LINED TUBES. — Some brass condenser-tubes in the United States cruiser "*Baltimore,*" after being in service for a year or more, were found to have experienced a peculiar change. In many places the metal was changed to almost pure copper, of a spongy texture, the zinc having completely disappeared. An investigation showed the probable cause of the failure to have been an electrolytic action between the tin lining of the tubes and the brass, the sea-water circulating through the condenser forming the electrolyte. Had the tin-coating remained perfect, no corrosion would have resulted; but the mud and grit carried in suspension through the condenser cut away the tin-coating in spots, and it was at these spots that the change of metal occurred. It was concluded that if the tubes had not been tinned at all they would have remained intact. — *Scientific American.*

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CONTENTS

SUMMARY: —
The Passage of the Bill to secure Designs for future Government Buildings. — The Copley Square Competition to be conducted by the Boston Society of Architects. — Death of George Snell, Architect. — Death of S. J. F. Thayer, Architect. — The Promotion of Vegetable Growth by Electric Currents. — Draughtsmen's Competitions under the Auspices of the Minnesota Chapter A. I. A. — Burglary as an Adjunct of Building Operations. 129
THE LANGUEDOCIAN SCHOOL OF ARCHITECTURE. — III. 131
THE ARCHITECT AND HIS MATERIALS. 133
LETTER FROM CHICAGO. 134
CHINESE CURIOS. — I. 136
SKETCHES OF ITALIAN ARCHITECTS: PALLADIO. 138
THE TOWER BRIDGE, LONDON. 139
BOOKS AND PAPERS. 140
ILLUSTRATIONS: —
The Lincoln Monument, Lincoln Park, Chicago, Ill. — Birds-eye View of Copley Square, Boston, Mass. — Laboratory Building for Mt. Holyoke College, South Hadley, Mass. — Gymnasium for the University of Virginia, Charlottesville, Va. — Lunatic Asylum, West Roxbury, Mass. — House at Guadeloupe, Mexico.
Additional: The Saratoga Bathing-establishment, Saratoga, N. Y. — Plan of the Same. — 52 Cadogan Square, London, Eng. — Château de Pierrefonds: Chapel and Grand Perron. — Premiated Design for an Oxford University-extension College. 143
NOTES AND CLIPPINGS. 143
TRADE SURVEYS. 144

THE country is to be congratulated on the final enactment, and approval by the President, of the law opening the designing of public buildings to the architects of the country. The details of the mode in which designs are to be procured are left to the discretion of the Secretary of the Treasury, but the main point — that the most important buildings in the country will be designed by architects of reputation, and not by clerks in the Government plan-factory — seems to be secured. What the result will be we prefer not to predict, lest we should be accused of an exaggeration which we wish to avoid. The New York *Commercial Advertiser* says that, "By assigning one structure to one architect, it is thought that the grandeur of European public buildings may be approached"; and it timidly adds, as if to try to justify so extravagant an assertion, that "the excellence of American architecture on private and State buildings attests the presence of genius and merit." So far as State buildings are concerned, it is an extremely rare occurrence for one of them to be intrusted to an architect of high reputation in the profession, and it would be very unfair to judge of what the best American architects can do in the way of public buildings by the achievements of the people who find favor in the eyes of State Legislatures; but of the designers of the great private buildings in American cities at the present time it is not too much to say that in originality, artistic feeling and skill in handling the masses which form the principal source of architectural effect they are not surpassed, or, as we believe, equalled, by any architects in the world; and if such men can be induced, by such treatment at the hands of the United States officials as they expect from private clients, to apply themselves in earnest to the Government architecture, not only will "the grandeur of European public buildings" be "approached," but, within the necessary limits of size, it will soon be far surpassed.

THE Boston Society of Architects takes a most unusual but very praiseworthy and public-spirited step in undertaking to conduct a public competition — the details of which will be found stated in our advertising columns — for the purpose of discovering the best way of rearranging and embellishing Copley Square in that city. Nothing more desirable could happen than to have such a solution of the problem discovered in this way as to at once prove the wisdom of the step, and so induce this society and others of similar character elsewhere to come out of their retirement and take hold of the difficult matter of municipal decoration and public convenience in such a manner as to convince the public that such matters should be intrusted to men of trained intelligence, and not to aldermen and city councillors, no matter how excellent and worthy they may be as citizens. Copley Square is at present, and is always likely to remain, the intellectual and artistic centre of Boston, so far as this can be topographically expressed, and hence should not by any chance be subjected to a treatment out of harmony with its real character. More than once this place has narrowly escaped mal-treatment, for there has been, we believe, no single movement to erect a statue or monument in Boston during the last fifteen years that has not induced a portion of the public, and often the promoters of the movement, to urge Copley Square as the only proper site for the structure. For many years these threatened disasters were averted by the willingness of Bostonians to listen to reason and good advice, and, since its formation, the Art Commission has exercised its powers on several occasions to the same effect. But the Art Commission is already a body threatened by the city politicians, because it has too faithfully performed its duties, and no one can guess how long its present powers will be left untrammelled. If one looks at the map of Boston, it will be seen that Copley Square forms with the City-hall, (on maps of the city adopted as the centre of radiation and measurement) the two foci of an ellipse within which the greater part of Boston proper lies, and this topographical fact suggests the propriety of making it a new point of departure, a place for pleasant and instructive lingering rather than a place to pass through by the shortest "cut."

ALTHOUGH the committee has sought to leave to the competitors the utmost freedom, it yet expresses a preference for a "central feature"; but this need not imply that it shall be a large feature, nor yet the only one. In fact we feel that the committee's real motive in making this one condition is that, through asking for such a feature, and getting it satisfactorily treated, they may find that they have gained an important point, in the event that the accepted solution should ever be carried into effect, in that, as the centre of the space had been suitably treated, the temptation to future promoters to place their pets in the centre of the square would be forever removed. As to whether this central feature shall be small or great, simple or elaborate, whether it shall be the sole feature or but one part of a scheme which shall embrace coördinating features on the sides or in the angles of the square, each competitor must decide for himself. We will but point out that it is not an easy or an obvious thing to find a motive purely architectural in itself, which, while according with the Public Library, shall not fight with the Museum of Fine Arts and be altogether overwhelmed by Trinity Church. If the aid of sculpture is to be summoned, then the competitor must decide whether allegory and symbolism are to form the main theme of the treatment, or whether the writers, artists, divines and statesmen of whom Boston is so justly proud are there to find in sculpture an expression of public recognition which they do not now actually lack in other forms and yet which in other countries would be accorded to them in the shape of public statues.

ALL Boston architects, and many in New York, will hear with regret of the death of Mr. George Snell, one of the oldest and best-known practising architects in the country, and the instructor, in their art, of many distinguished members of the profession. Mr. Snell was born in London, England, in 1820. He was carefully prepared for his profession. He was graduated at King's College, London, and received special instruction in mechanics, of which he had a thorough knowledge, from the celebrated Canon Moseley. He was then articled as a pupil to Harvey Lonsdale Elmes, the architect of St. George's Hall, Liverpool. In 1850 he came to Boston, and his taste and knowledge, with his charming social qualities, soon brought him into notice. Nearly all the principal Boston architects of middle age were at some time his pupils, and many in other cities owe the best part of their instruction to him. In his professional capacity, he soon found employment in both private and public work. The Boston Music Hall, one of the best concert-rooms in the country, was designed by him, and, while perhaps the earliest example in the United States

of the application of modern acoustic science to building, still remains one of the most successful. Besides this, which is perhaps his most important work, he built the Studio Building, noted in its time as a very clever example of brick architecture, the Hotel Oxford, the Concord Public Library, the South Boston Church Home for Destitute Children, and a very large number of private houses and mercantile buildings. If he had been a stirring business man, like some of the modern architects, his list of public buildings might have been longer, but his tastes were in every way quiet, and he preferred his two rooms in the Studio Building, with one or two draughtsmen to help him, to the bustle of a huge office with an army of assistants. About 1860, when he was overcrowded with commissions, he took a partner, Mr. Gregerson, in conjunction with whom a considerable portion of his work was done. Personally, Mr. Snell was the incarnation of courtesy and amiability. He was never married, and had no establishment beyond his simple bachelor-rooms, but he was always honored and popular in the many clubs to which he belonged, and in general society.

IT is pitiful to contemplate the agony of mind which a man has had, for who knows how long, to struggle against before he is brought at last to cast aside voluntarily the boon of life, which, to his fellows, seems so priceless. The gradual loss of business and the ensuing financial difficulties that seemed to Samuel J. F. Thayer, an architect of Boston, so insupportable, might to others seem trivial and endurable evils, but he thought otherwise, and on Tuesday last closed his career. Born in Boston, August 20, 1842, Mr. Thayer entered, at the age of sixteen, the office of J. D. Towle, and seemingly left it a few years later to enlist in the Fifth Massachusetts in 1862, from which he was promoted to the engineer service in the Eighteenth Army Corps, where he served, we believe, till the close of the war. On returning to Boston, he gradually built up a good and substantial practice, and in the twenty following years designed and built a large number of buildings, some of which at the time attracted considerable attention. Amongst his best-known work may be named the town-halls at Brookline and Stoughton, Mass., the City-hall at Providence, R. I., the library for Dartmouth College and the Nevins Memorial at Methuen, Mass.

A NEW device for stimulating vegetable growth by means of atmospheric electricity has been tried with success in France, and, as the apparatus is very simple, it will be easy for those interested in the subject to pursue the investigation for themselves. It seems, according to *Le Génie Civil*, that electric culture has been tried before. One experimenter, at Antibes, planted Indian-corn in a flower-pot which was connected with the lower end of a lightning-rod, but did not secure any particularly favorable results; and others have grown peas, cabbages and chicory in earth electrified by a Leclanché battery, also without remarkable success. From these attempts, it has been inferred that electricity had no favorable effect on vegetation; but Father Paulin, at Merlieu, near Montbrison, has tried a very different apparatus, with, as it seems, encouraging results. His apparatus, which he calls a "Geomagnetifère," consists of a pole of resinous wood, forty or fifty feet long, fixed in the ground, and finished with a porcelain cap, and a number of insulators. A galvanized wire, attached to the insulators, has the upper end, which extends to some distance above the top of the pole, divided into five branches, which radiate like a fan, while the lower end is connected with a sort of gridiron of wires, buried in the earth at a distance of twelve or fifteen inches from the surface. The object of this arrangement is, of course, to convey electricity from the air to the earth. As the electrification of the soil is said to be perceptible a metre from the wires, these may be placed six feet or so apart; and plants growing in the ground over them seem to be favorably affected by the influence. In Merlieu, at least, where, in a large potato-field, a circular area forty metres in diameter was furnished with the geomagnetic wires, the potatoes over the wires grew with extraordinary luxuriance. At the request of a commission of scientific investigators, two tracts, of sixteen square metres each, were marked out on the wired land, and two similar tracts on the unwired part of the field, and the product of each was weighed. The potatoes gathered from the thirty-two metres of wired land weighed ninety kilogrammes, while those from the equal area of unwired land weighed sixty-one kilogrammes. Somewhat later, two similar tracts of wired and unwired land, each containing sixty square feet, were compared, and the unwired soil was found to have yielded thirty-eight kilogrammes of potatoes, while the sixty wired feet produced sixty-three, and it was evident, from the greenness of the stalk and the thinness of the skin on the tubers, that the growth of these potatoes was not yet finished, while those on the unwired land were fully ripe. Where similar experiments were made in a vineyard, the grapes from the wired land contained about sixteen per cent more sugar than those from the unwired land.

THE Minnesota Chapter of the American Institute of Architects has hit upon an excellent idea for encouraging practice in design, and study of detail, among the draughtsmen of the State. Instead of announcing a single competition, to be held within a limited time, and on a single subject, which attracts only a limited number of competitors, it has published a little pamphlet containing the programmes for twelve competitions, to be held monthly through the year. The subjects are small, such as an entrance-doorway, or a window dressing, or a mosaic floor, but plenty of taste and study can be expended on them, and it is of immense advantage for draughtsmen in offices to have the whole set of programmes in mind, not only that they may use their leisure moments, which may not come regularly every four weeks, to advantage, but that, knowing all the subjects to be studied during the year, they can gradually pick up ideas upon all of them during the course of their ordinary work. One set is handed in every month, and voted upon by the members present at the regular monthly Chapter meeting. All the designs are under cipher, and the secretary, who alone ascertains the names concealed by the cipher, makes a record of "first mention" against the name of the competitor receiving the highest number of ballots, and "second mention" against the name of the competitor placed next. At the end of the year, the first and second mentions for the year are counted. Each first mention counts as two points, and each second mention as one point; and to the person who has gained the highest total number of points is awarded a gold medal, while a silver medal is given to the one who has the next highest number. As an ingenious and effective plan for keeping up the interest of draughtsmen throughout the entire year, at no very great expense, we commend this scheme to the attention of all Institute Chapters and similar societies.

THAT there is such a thing as being too zealous in good works, Mr. Michael Cleary discovered the other day. The monstrous new building of the Manhattan Life Insurance Company is to stand on the site now occupied by several small structures, and these smaller buildings are in process of being removed, to make way for the giant. In the basement of one of the little houses Mr. Gossford keeps, or did keep, a restaurant, holding his room on a lease, which expires May 1 next. The Insurance Company had bought out all the other leases on the property, but Mr. Gossford, finding himself very comfortable where he was, refused to sell his lease, or to move until its expiration. As the Company is in a hurry to get its building done, it has not taken any special pains to make Mr. Gossford happy in his present location, and a few days ago, according to the daily papers, the workmen began tearing down the upper part of the building over his head. Considering, with some reason, that this manœuvre interfered with his rights as a tenant, Mr. Gossford obtained an injunction, restraining the Company from meddling with the structure; and the Company brought a counter suit to dispossess him. Mr. Gossford, fearing some nocturnal interference with his rights, employed a watchman to guard his restaurant at night; but a few nights ago the watchman mysteriously disappeared, about ten o'clock, and half an hour later a policeman who happened to be in the neighborhood heard the sound of an axe. He ran toward the sound, and arrived at the site of the new building just in time to see seven men drag Mr. Gossford's lunch-counter up the basement-stairs and throw it into the street. The officer, finding that the restaurant had been completely wrecked, arrested the foreman of the party, Michael Cleary, and carried him off to the station-house, where a charge of burglary was entered against him, and he is now awaiting trial.

THE LANGUEDOCIAN SCHOOL OF ARCHITECTURE.[1] — III.

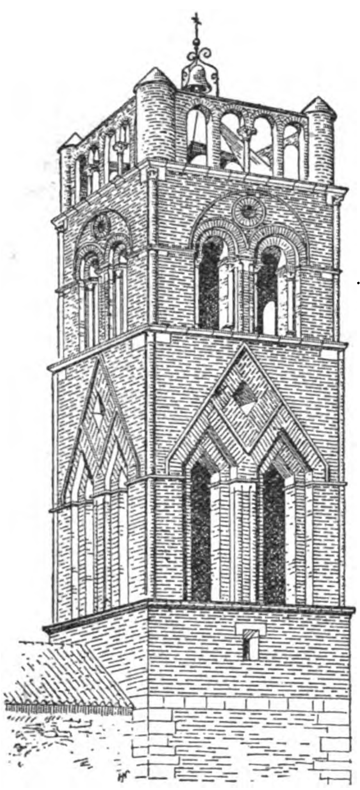


Fig. 9. Belfry of Donzac.

THE type of wholly Gothic single naves became fixed at Toulouse from about 1240, by the construction of the churches of the Jacobins and the Cordeliers. Although the former has two equal naves like the Dominican churches of the period, it possesses the external dispositions of churches with one nave, and particularly of those of the Toulouse school, with their massive buttresses connected by huge ogival machicolations surmounted by covered galleries lighted through small round or square apertures, — the latter set on the angle. This type attains its most monumental expression in Sainte-Cécile at Albi (1282–1431); here the buttresses are in the interior, with two-storied chapels between. The cathedrals of Saint-Bertrand (1304–1320), of Lodève (fourteenth century), Lavaur (fourteenth century), Mirepoix (1401–1431), Perpignan (1324-1509), Condom (1506–1521) and the churches of the lower city of Carcassonne (Saint-Michel, the new cathedral, and Saint-Vincent), of Gaillac (Saint-Michel and Saint-Pierre), the church of the Augustinians and La Dalbade, at Toulouse, the churches of Beaumont-de-Lomagne, of Montpezat and Moissac (Tarn-et-Garonne), of l'Isle-d'Albi, of Rabastens and Saint-Sulpice (Tarn), of Larroumien (Gers), of Vias (Hérault) and many others, are related by various characteristics to the family of great structures without side-aisles. To these may be added the nave of the cathedral of Béziers, the choir of that of Viviers, the abbey-church of Simorre (Gers), the Cistercian church — now in ruins — of Bellocq or Beaulieu (Tarn-et-Garonne) and Notre-Dame of Villefranche-de-Rouergue, each of which retains its own individuality. The last three have, by exception, transepts; at Villefranche the arms round into apses at the extremities. At Bellocq and at Simorre there is even a central tower.

Fig. 10. Belfry of Saint-Béat.

The breadth of the finest naves varies, in the clear, from fifty to seventy-two feet. The grandest of all is that of the Cathedral of Mirepoix. Then follow Saint-Vincent, at Carcassonne, and the cathedrals of Perpignan and Albi. The width between the side walls is seldom less than forty feet; the base was therefore too broad for a central tower. The Romanesque tradition as to the position of the tower was consequently not perpetuated — save in the two cases cited above — in any churches except those that had been begun and had to be completed, as at Saint-Savin, Tarbes and Saint-Lizier. The Languedocian belfry of the fourteenth, fifteenth and sixteenth centuries rises, as a rule, on one side of the choir. Moreover, it was the Romanesque octagonal form that was maintained, and it was the Languedocian school that held the most important place in these constructions down to the close of the seventeenth century. The Toulouse architects put a powerful, individual stamp upon their polygonal towers by substituting for the semicircular and broken arch a sort of triangular crowning which it is difficult to attach to either of these figures. Ordinarily the bays with angular crowning are disposed in pairs beneath an equally angular framework, making an opening in the tympanum in the form of a square set as a lozenge. Isolated squares of this sort are pierced, instead of oculi, above the long windows of the structure, or to admit light to the circular passages. The best examples of these productions are seen at Toulouse itself, in the central tower of St. Sernin and in the elegant tower of the church of the Jacobins; it is probably in one of these that the type originated. We do not believe that the square belfry of Donzac (Tarn-et-Garonne), in which all the signs of a transition may be observed (Fig. 9), dates further back than the latter part of the thirteenth century. It will be remarked from this example, and several others that might be cited, that the square belfry was maintained along with the octagonal; however, not much artistic talent was devoted to it. The Toulouse School bestowed more care on the so-called fan belfry; it was constructed by carrying up the western gable and piercing it with arches in which the bells were directly suspended. This type, the finest Romanesque example of which may be seen at Saint-Béat (Fig. 10), was utilized, from the end of the thirteenth century, for strategical devices, which further complicated it while at the same time it imparted a monumental aspect to it that it would not have had otherwise (Fig. 11).

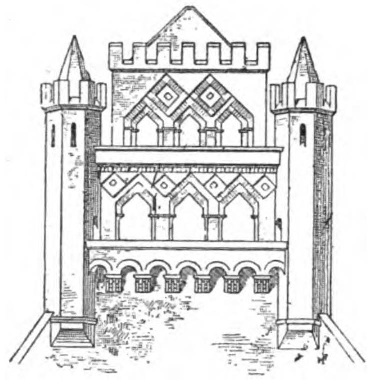


Fig. 11. Belfry of Le Taur, at Toulouse.

The attention that was given to the fortifying of the churches is apparent in a great many dispositions that we have not referred to at all. Thus it was that many of the beautiful octagonal towers were reared on a square mass with machicolations and that, in the apse of the cathedral of Narbonne, the flying-buttresses were themselves made to serve for defensive purposes. The entire façade of the cathedral of Béziers is a military work, in spite of its great rose-window and notwithstanding the richness of the portal.

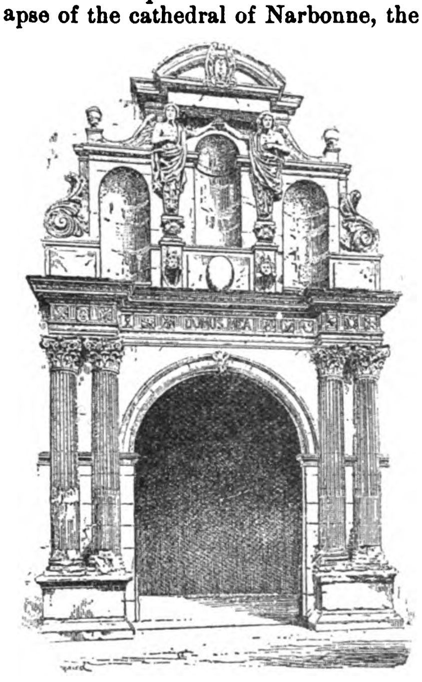


Fig. 12. Portal of St. Peter's, at Toulouse.

The Renaissance set no special seal on religious edifices. The remarkable portal of La Dalbade, at Toulouse, has an originality but little affected by local influences. But these influences are more apparent in the portal of St. Peter's (Fig. 12), erected later, at the period when the School of Toulouse was in the fulness of its vigor, that is under Louis XIII. This reign also marks the date of the small cloister of the Augustinians. The artistic celebrity of Toulouse in the modern period rests mainly on the beauty of its private mansions; they are noted for their doors and windows with caryatides, their false machicolations, their low arcaded galleries forming attics, and for many other distinctive characteristics which are in great part shown in the two representative examples here presented (Figs. 13, 14).

[1] From the French of Anthyme Saint-Paul, in Planat's *Encyclopédie de l'Architecture et de la Construction*. Continued from No. 896, page 116.

The influence of Toulouse Renaissance architecture affected the construction of the château of St. Elix (Haute-Garonne); but it amounted to nothing in the châteaux of Bournazel and Graves (Aveyron), whose architects were inspired by Georges Philandrier, himself imbued with Italian teachings.

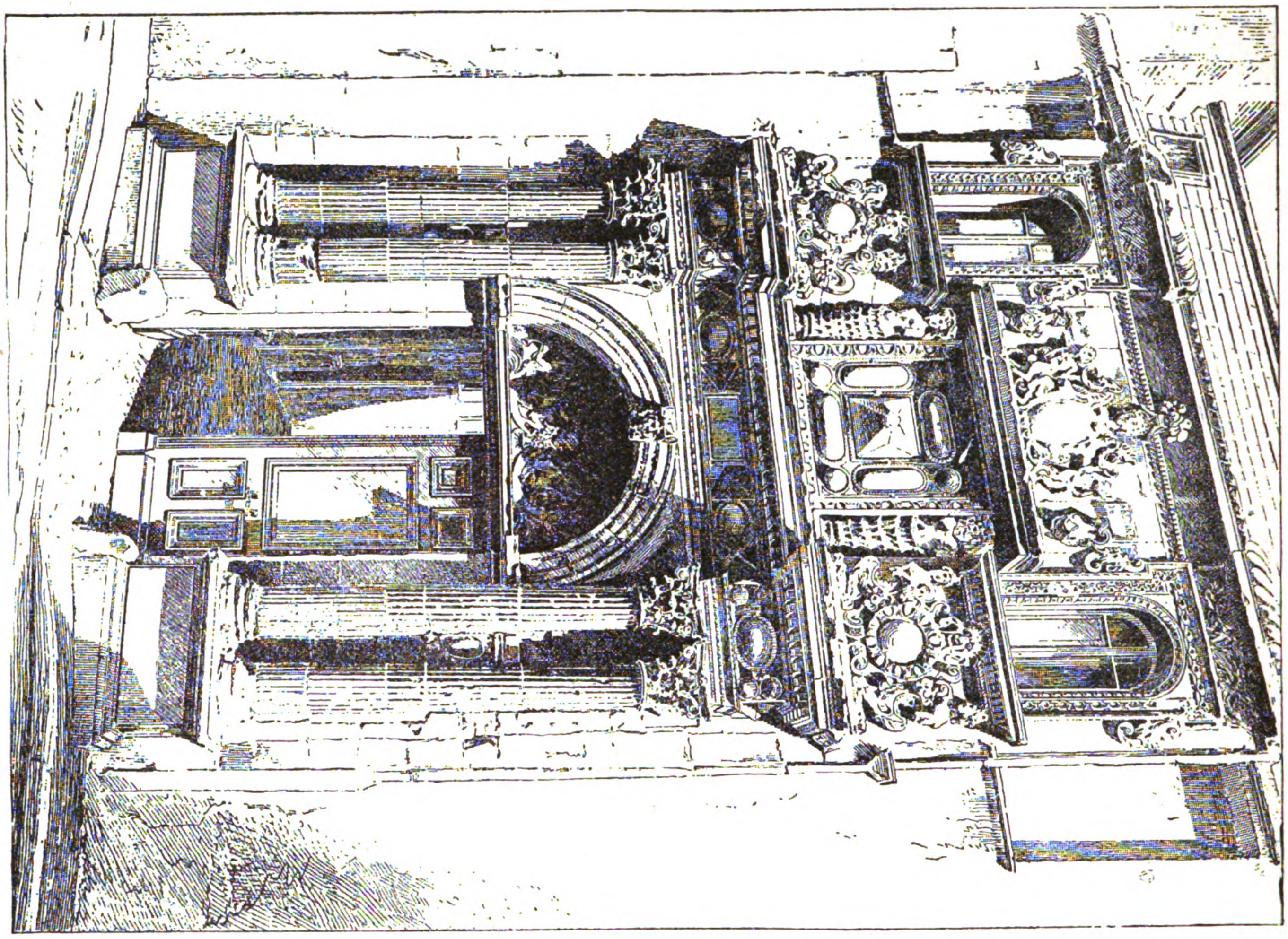


Fig. 13. Entrance to the Hôtel Felzins, Toulouse.

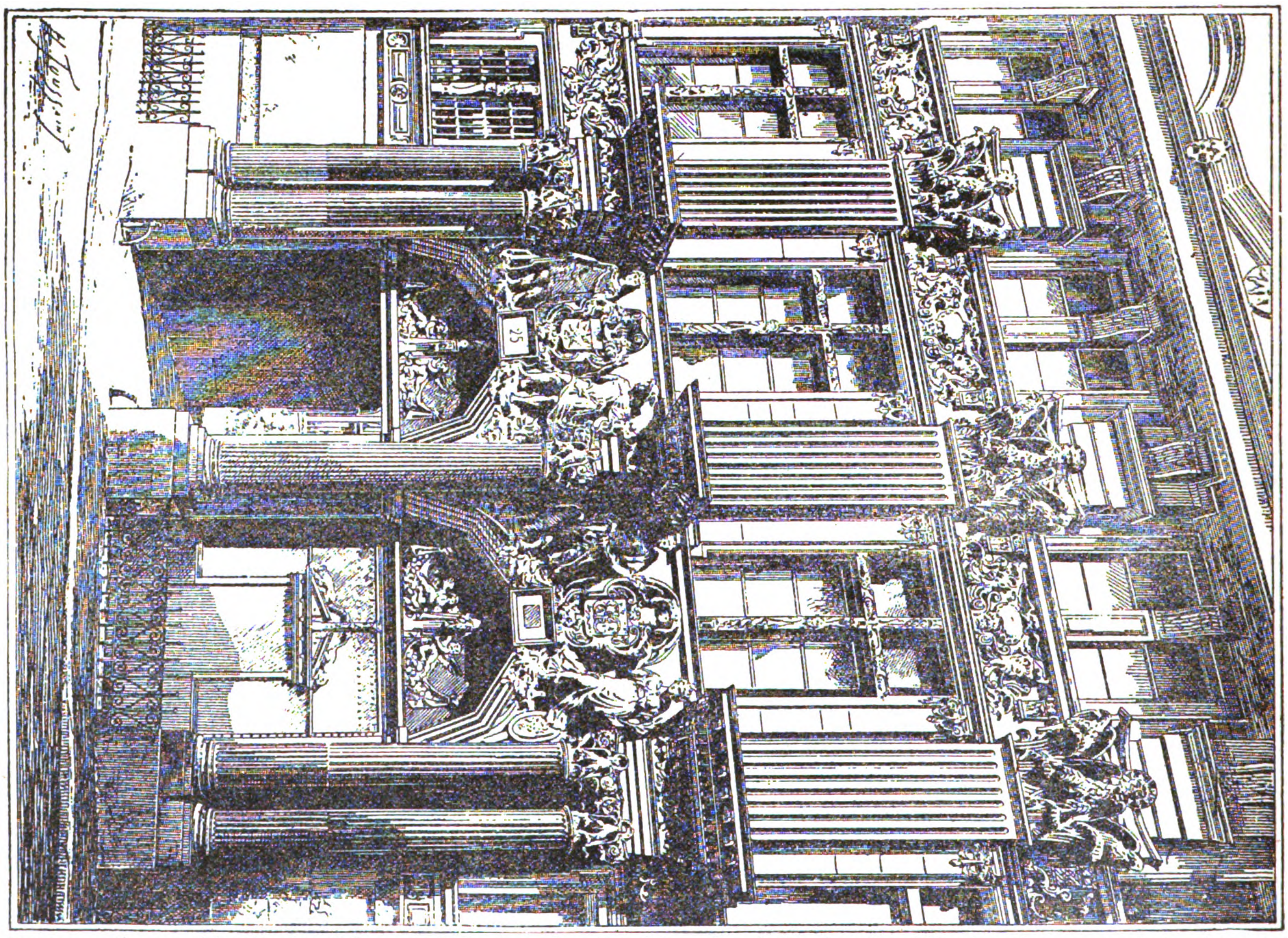


Fig. 14. Stone House, Toulouse.

The chief feature of the mediæval civil architecture of the Languedocian School was the foundation of fortresses or new cities, often laid out on the following plan: a regular perimeter, four principal streets disposed in pairs at right angles to each other, and forming at their intersection a central square which

was surrounded by arcades. Montauban, built in 1144, is the oldest of these; but the movement did not reach its height until between 1222 and 1340. Although it was not confined to Languedoc and Gascony it originated and attained its greatest force in these two provinces. The cities that have preserved

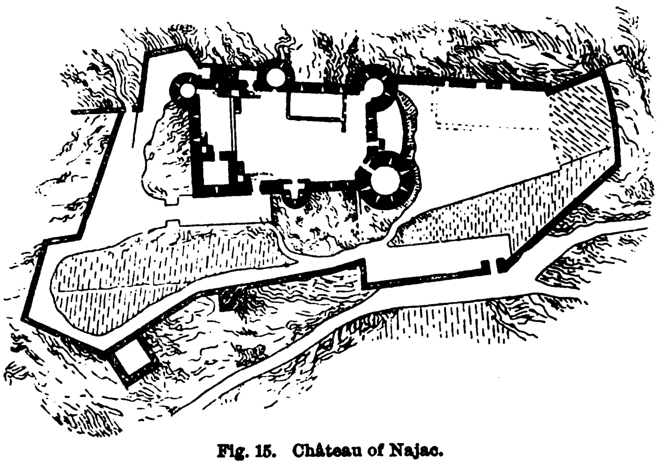


Fig. 15. Château of Najac.

the most characteristic plan of these fortresses are: Grenade, Plaisance and Villefranche, in Haute-Garonne; Mazères and especially Mirepoix, in Ariège; Pampelonne and l'Isle-d'Albi, in Tarn; Sauveterre and Villefranche-de-Rouergue (in the latter the perimeter is irregular), in Aveyron; Beaumont-de-Lomagne, in Tarn-et-Garonne; and Marciac in Gers.

Feudal architecture remained quite elementary throughout the Middle Ages. The donjons, which were always on a rectangular plan prior to the fourteenth century and usually so afterward, were sometimes of so little importance that they could be used only as observation-towers. Gaston Phœbus, count of Foix and Béarn, in the second half of the fourteenth century, originated a type of huge rectangular donjons which he himself adopted at Lourdes, at Pau, at Montaner, at Mauvezin and possibly also at Mazères. The three towers of Foix served successively as donjons; the most modern is cylindrical, a form which is less rare in Ariège than elsewhere. The flanking towers are generally wanting; quite fine ones, however, exist at Pau and at Puivert; they are square. It may be set down as a fact that the châteaux antedating the fifteenth century which possess large cylindrical towers, like those of Bellocq (Basses-Pyrénées), of Najac (Aveyron) and of the Cité of Carcassonne, are traceable to an influence proceeding directly from the royal domain. This is certainly true as to the last two examples. The fortifications of Najac (Fig. 15) are due to Alphonse of Poitiers, the brother of Saint-Louis, and those added to the Cité of Carcassonne were built in accordance with the instructions of Saint-Louis and of Philip the Bold.

ANTHYME SAINT-PAUL.

THE ARCHITECT AND HIS MATERIALS.

Miserere in Choir of Amiens Cathedral. From *L'Art pour Tous.*

DURING a season of temporary mental aberation, the somewhat pessimistic writer of the present paper once wrote a book on Structural Materials. Once written, he sought a publisher, and in endeavoring to secure from him as reasonable terms as possible held forth to some length on the great utility of such a work to architects. To his surprise, he was promptly met with the response that architects didn't buy books! As he who made the statement was a man of long experience in technical as well as strictly scientific works, besides being publisher of an architectural journal, I could but accept it, though at the time with certain mental reservations.

Subsequent observations on this very point have, however, led me to believe that, however correct his statement may have been with regard to books in general, it was certainly true with regard to works on this particular subject. I am fain to believe that the average architect of to-day is not only sublimely ignorant regarding the character of the materials he uses, or rather that are used in structures he designs, but that, further, he makes little effort to inform himself. This may seem a harsh statement, but I cannot consider myself as at all to blame in the matter, since I am merely stating the results of my experience.

To the average architect there are but four classes of stone: granites, "freestones," marbles and limestones. As to how these stones differ, what are their essential qualities, which the more durable, he has little idea. He may perhaps be able to refer to certain tables in somebody's hand-book, or pocket-companion, and give you the exact figures in pounds per square inch that carefully prepared cubes of certain stones bearing these names, at some time, somewhere, under special conditions — never to be reproduced in actual building — have been found capable of enduring. But that is all. Yet such men go on with the utmost self-complacency designing, year in and year out, structures good, bad and indifferent, from both utilitarian and architectural standpoints, and which are perhaps erected under their personal supervision. The condition is very peculiar, and quite unlike anything I ever met in other callings.

Can one imagine a sculptor carving a Greek slave or a Venus from a mud-colored, blotched and cellular limestone? or a painter who depends for his effects wholly upon perspectives and outlines regardless of light and shade or the blendings of color? I have often marvelled that Ruskin, in all his searching criticism and self-assertions, should have laid so little stress upon the subject of materials; but possibly, never having seen our "Church of the Holy Zebra"[1] and its numerous counterparts, the necessity for such was not appreciated. Still I have often wondered if something of this sort was not in his mind when he wrote: "And among the first habits that a young architect should learn is that of thinking in shadow, not looking at a design in its miserable liny skeleton, but conceiving it as it will be when the dawn lights it and the dusk leaves it, when its stones will be hot and its crannies cool, when the lizards will bask on the one and the birds in the other. Let him design with the sense of cold and heat upon him; let him cut out the shadows, as men dig wells in unwatered plains.

"His paper-lines and proportions are of no value; all that he has to do must be done by spaces of light and darkness; and his business is to see that the one is broad and bold enough not to be swallowed up by twilight, and the other deep enough not to be dried like a shallow pool by a noonday sun." — ("*Seven Lamps of Architecture.*")

I remember, not long ago, while in conversation with an architect of more than average ability and experience, of speaking concerning the quality of the materials used in one of his latest efforts. Judge my surprise at learning that he knew nothing regarding it, and stated that he did not trouble himself about such matters. He prepared the plans and left the question of materials for the owners and builders — preferred not to be bothered with such questions! This may have been an extreme case, but the man in question was one of the best in a city of upwards of 200,000 people.

I have known the late architect Richardson to devote a great deal of attention to finding just such a stone as he deemed fitted for any piece of work, but so far as I know personally, his decision was controlled always by his artistic sense; it was the matter of color, of light-and-shade, that decided the question, and one of his best efforts, what is in fact, from an architectural standpoint, one of the finest buildings in America, has the weakest stones in the position of greatest strain, simply because the contrast of color was thus best brought out. One of the most expensive Government buildings in Washington, a structure of most elaborate design, totally loses its effectiveness, owing to the fact that the stone of which it is built is quite inappropriate for that design. It is of course possible, and even very probable, that Mr. Mullett, working under Governmental supervision, was not free to use his own judgment in the matter; but the fact remains, nevertheless. The architects whom it has been my fortune to meet during the past ten years seem to have learned that there are certain kinds of stone upon the market, and which are known to them, perhaps, as Indiana or Ohio "freestone," Portland "brownstone," or Maine granite, and these are used indiscriminately, the decision being controlled only by matters of expense and, possibly, color. They do not for a moment consider the climatic conditions to which a stone is to be exposed, nor apparently realize that a stone suited for Denver, Col., may be worthless in Bangor, Me. The stone has been used in times past, is accessible, or is the cheapest, and in it goes without further question. I have more than once asked an architect his reasons for using a particular stone, and have yet to receive an answer in any way satisfactory. In most instances the stone had been used wholly without a thought as to its fitness, and I might as well have questioned him regarding the larval stages of a certain species of ichneumon-fly. Few seem to realize that a light-colored stone such as may serve well for a city like Washington or surburban dwelling is quite unfitted for smoke-laden cities like Chicago and St. Louis. A finely carved, highly ornate front of soft Indiana oölite, stained and streaked with smoke, is not merely no more effective than a plain brown front, but it is positively unsightly. The two Vanderbilt residences on Fifth Avenue, New York, the one a brown sandstone and the other a light-colored limestone, illustrate

[1] I do not now recall the exact structure in New York City to which this title was popularly applied. It was, I believe, one of the numerous agglomerates of green serpentine and gray and brown sandstone, so conspicuous for their fantastic ugliness.

this point well. The one of sandstone is uniformly dark and agreeable. The light front of the other is soiled and stained, for all the world, like a dirty garment. The same condition of affairs, but greatly exaggerated, exists in Chicago, or in any city where soft coal is consumed. In such cases, not only should stone be selected of such color as to least show the streaking but the walls should be of such finish as to afford the least lodgement for particles of dirt. Among crystalline siliceous rocks, a rock-face finish, where the natural facets of the crystals are exposed, will be found best suited: with sandstones and limestones, a sawn or smooth-ground surface. Pointed, tooth-chiselled, patent-hammered, or carved surfaces serve only as dirt catchers, and are but comparable with the costly laces on the bottom of a woman's skirts — conspicuous for the filth they carry.

Now whether the architect is or is not wholly responsible for this peculiar condition of affairs, it is not necessary to discuss here; but, obviously, such ought not longer to exist. The responsibilities of the architect are — or at least should be — enormous. "The construction of a dwelling, business-block, public building or monument is a matter in which each individual citizen has a perfect right to have an active interest, since the structure, once erected, becomes for a time a fixed feature of the landscape, and an object by which not merely the taste and abilities of the architect and builder are to be judged, but that of the community as well. The external features of the structure are constantly before the public and must exercise some influence, either beneficial or detrimental, upon public taste. It behooves the builder, therefore, quite aside from all economic considerations, to select for his purpose such material as shall be most harmonious in the finished structure, and possess as well such qualities as shall be enabled to withstand the ravages of time without serious injury.

"There are few things more conspicuously unsightly than a rich and elaborate building constructed from materials which, under the ordinary chemical and physical agencies of the atmosphere, have become discolored or disintegrated. Yet our cities and towns are replete with illustrations of such lack of forethought, or of ignorance on the part of builders.[1]"

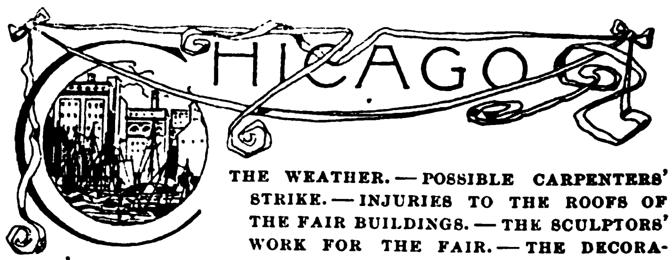
Now, in case any architect shall have had the patience to read this article through, he will very likely contend that, like his colaborator mentioned above, the character of the material used does not concern him. But in this I must beg leave to differ, for if — to appeal to Ruskin once more — "Architecture is the art which so disposes and adorns the edifices raised by man that the sight of them may contribute to his mental health, power and pleasure," then certainly he must be more than a mere artist or compiler of specifications. He must combine to a certain extent the qualities of artist and engineer. So far as my own observations extend, the larger proportion of architects lean more toward the artistic side, and it is, I believe, very largely due to this that the erection of business structures in our large cities has become almost wholly a matter of engineering. From a practical standpoint, the engineer is the more progessive man of the two. He perhaps, in only too many cases, wholly loses sight of the artistic side, and his structures have no architectural features whatever. It is interesting to observe, in looking over the literature on the subject, how large a portion of the work of research on structural materials has been made by engineers. At the present moment I call to mind but a single instance in which an architect has turned investigator, and he, though instrumental in designing one of the most impressive buildings in the city of Washington, was not, I believe, considered much of an architect!

Even in cases where attention is given to the character of the material, I doubt if energies have been judiciously expended. Apparently, more attention is paid to the matters of ultimate strength and fireproof qualities than to the natural weathering characteristics of a stone. This last condition is, perhaps, not strange, since the disastrous results produced in a few hours by fire are more noticeable by contrast than though brought about by gradual changes from day to day. There are few, if any, stones that can be called actually fireproof — that can pass through the fierce heat of a conflagration without serious detriment. Certain siliceous sandstones, not too compact in texture, and laid on the quarry-bed, and the basic trappean rocks, like the "black granites" of Maine, Pennsylvania and New Jersey, possess probably as good fire-resisting properties as any; but it is worse than useless to construct the walls of a building of stone of any kind, or even brick, and then fill the interiors with inflammable materials such as shall convert the entire structure into a furnace on the first favorable opportunity. More attention needs to be paid to incombustible interiors, for this is where the fires originate, and it is only when the flames acquire such fierce headway from the fuel from within as to be temporarily uncontrollable that the adjoining exteriors begin to suffer. Any properly constructed stone building should have a brick lining, and, so far as my present experience goes, the injury done is, as a rule, to the outer surface, rather than the inner. Let our architects and engineers design some practicable form of fireproof interior construction, and the problem of matter for the outer walls resolves itself into one of natural weathering. As to the matter of compressive strength, it can be said that, for all ordinary structures, the capacity of any stone to withstand more than from 6,000 to 10,000 pounds per square inch of surface is of as little moment as that of lunar attraction; and yet these figures are those of the weakest stones upon our market. The large majority go so far beyond that a mere personal inspection is worth more than all the pressure-tests that can be applied.

There are, of course, architects who can justly claim absolution from the calumny thus far heaped upon them. I would that there were more. The article has, however, not been written for the purpose of crying down the profession, but rather for the purpose of calling attention to what appears to me to be a very serious discrepancy in architectural training. In many of our technical schools steps are being taken toward instruction in this very line, and it is a move that deserves most hearty commendation.

George P. Merrill.

[1] "*Stones for Building and Decoration*," page 350.



THE WEATHER. — POSSIBLE CARPENTERS' STRIKE. — INJURIES TO THE ROOFS OF THE FAIR BUILDINGS. — THE SCULPTORS' WORK FOR THE FAIR. — THE DECORATORS' WORK. — THE COLD-STORAGE WAREHOUSE. — THE RAILROAD TRACKS. — THE AUDITORIUM ANNEX. — THE ILLINOIS CENTRAL STATION. — THE ARCHITECT TO THE BUREAU OF EDUCATION.

STILL winter in full force is with us and people who enjoy a "thorough thing" are enjoying this season to their full. First the mercury plays around the zero-point and then rises to the grade appropriate for the January thaw, only to flood the streets and walks with water, which, in its turn, quickly congeals, covering everything with ice. Such has been the weather which builders have had to contend against for the last month. It has required strenuous exertions to carry on the work on the partly finished buildings, while to undertake work on excavations has been quite impossible. Consequently this year has so far shown little activity among architects. The large amount of building undertaken last year, the cold weather and the advance in cost of material seem to be reasons enough for the present dullness. The scale of prices which was correct some months ago is approximately correct at present. Bricks are now quoted at ten dollars a thousand, which is higher than they have been for several months, while lumber is also in the ascending scale. There is a vague rumor and feeling at present that the first of April will see inaugurated a carpenters' strike, though the object of the strike seems as yet undetermined. At present eight hours constitutes a labor-day, and thirty-five cents an hour is the minimum rate of wages. Possibly because nothing else can be thought of that the oppressed laborer would be likely to demand, it is reported that a demand for the employment of union men to the exclusion of non-union men will be made. This report is decidedly vague, however, and it is to be hoped that the substance, if one really exists, which gave rise to it, will grow still more vague as the time for its appearance approaches.

Apropos of the cold snowy weather, it is appropriate to speak of the great drawback it has been to the work at the World's Fair grounds, and the trouble which has arisen from the weight of snow and ice on the roofs of the buildings. Judging from the winters of the last five or six years, such a strain to the structures was a thing little to be expected and not necessarily to be counted upon, and consequently many of the roofs, or rather portions of the coverings, of them have given way under the pressure of ice and snow. A rather exaggerated idea has obtained as to the extent of these damages and people have pictured to themselves the whole Liberal Arts Building one vast skating-rink. This is fortunately not quite the case. During this fearfully icy weather no man could be sent aloft to repair the damages, and the result has been that the rains have descended and the floods have come directly into the buildings in various isolated spots. Had any of the exhibits been in place, it would have been quite another matter. The greatest sufferer has been the huge Liberal Arts Building, while, from its ponderous proportions, its roof will be the most difficult to repair. The Transportation and Agricultural Buildings have suffered considerably, either from breakage or leakage, while the Electrical Building has stood the test much better. The interior of the dome of the Fishery Building, which had received its final coat of coloring, has become quite disfigured. However discouraging the interior may look at present, those having the affair in charge say it will be only a matter of a little time to make the repairs whenever the weather will permit their being undertaken — and most surely the weak points of the roofs have been well pointed out by this roaring winter of ninety-three. The staff statuary on the outside of the buildings seems not to have suffered at all by the boisterous treatment, upon which every one who appreciates what is really fine and good ought to congratulate himself.

Much, very much, has been said about the success and beauty of the buildings, while comparatively little notice has been taken of the great excellence of the work of the sculptors. The uninstructed and generally unappreciative public here is being aroused to the worth of

the work, by means of very charming talks given this winter on this subject of the World's Fair sculpture by Mr. Lorado Taft, one of the men who has helped to make this part of the work a success. Even if it has been one's business to keep oneself well posted in this especial branch of art, even if for years one has shuddered over the monstrosities on the National Government Building, even if silent adoration before Powers's "Greek Slave" has not been our accustomed attitude, to see these productions thrown on a screen from a stereopticon-slide, by the side of these fine and beautiful works which are to be seen at the World's Fair, makes one realize that it is "not for nothing" that so many of our young men have been spending precious years abroad in foreign schools and studios. Let us fervently pray that this fine work may lead to an appreciation of something better than the once so popular galvanized-iron ladies with jelly-mould heads and breasts.

The kindred arts of architecture and sculpture will gain much in this country if they can come to each other's aid, as in the old times in the Old World. Mr. Martiny, the chief embellisher of the Agricultural Hall, seems, of all the sculptors, to have most satisfactorily solved the problem of what one might call architectural sculpture. He has been wise enough not to look at his work simply as his work, but the question has presented itself to him, how to best make it a part of the building which it was to decorate. The result is very charming.

It seems as if there was no department of art as to which the American public possessed such dense ignorance — and that is saying a good deal — as this of sculpture; and it will be interesting to watch the awakening, an awakening which must as inevitably follow in this case as did that which aided in the appreciation of painting after the Centennial Exhibition in this country.

The decorators are hard at work either in studios on the grounds or on comparatively smaller works in their own up-town studios. Melchers is busy with a Julius Cæsar with snow-white hair and pea-green olive-wreath, which, with its accompaniments, is to be raised sixty feet in the Liberal Arts Building. It will be curious to see what will be the coloring of this work when sixty feet of atmosphere lies between it and the spectator. Owing to the well-known reputation of its artist, one feels there is a "know how" about it and not any uncertain hit-or-miss. Some of the decorations of the smaller domes and recessed arches are especially good, and it is to be hoped that the exhibits will not take all eyes away from them. There will undoubtedly be published some illustrated series of these works which will make the originals familiar both to those who are lucky enough to see them and those who have the misfortune to miss them.

Work has begun on the booths in the various buildings and before long the interiors will present quite a different appearance from what they have had heretofore. The industrial court of the Mines and Mining Building is already gay with the colors used in the booths. Building-permit for pavilion No. 1 in the Liberal Arts Building has already been granted to the Chicago firm of Lyon & Healy, manufacturers of musical instruments.

An interesting building on the grounds is the Cold-storage Warehouse, which in itself serves as an exhibition of what cold-storage can do, together with the ice-making process: it will at the same time furnish ice and ice-cream for the entire grounds, while the vegetables, meats, butter, eggs, etc., for all the restaurants will be stored within its walls. The structure will measure over one hundred by over two hundred feet, five stories high, surmounted by three towers, the highest one, in the centre, nearly two hundred feet. The roof itself will be enclosed by a balustrade, giving a chance for a promenade for those who are not able to get enough walking in other ways. Everything will be so arranged that visitors may circulate through the buildings and watch the various methods of ice-producing. Through the arched doorway one will enter a circular gallery from which one can look down on a nine-hundred horse-power steam-plant. This will furnish power for the large elevators placed in each corner of the building, as well as for the dynamos, for the electric light and the hoisting apparatus. In the rooms of the ice-machines may be seen the entire workings of an apparatus with the capacity of turning out over a hundred tons of ice a day. Across from these rooms, on the other side of the building, are to be the ice-storing rooms, where provision will be made for the storage of three thousand tons of ice. The walls separating the rooms are composed of alternate layers of heavy paper and cleated boards with double air-spaces intervening. Around each room run the coils of pipe by means of which the rooms are cooled. Practical tests will be made as to the proper temperature for storing different kinds of provisions. The ice-cream plant will be on the fifth floor, the freezers being operated by steam and cooled by ammonia vapors.

The work on the elevation of the Illinois Central tracks has been carried on with only occasional interruptions through the winter. This being the road by which the great bulk of visitors will reach the Fair, the greatest energy is necessary in the work that all may be completed by the first of May. As the stations were all on the opposite side of the tracks from the Fair Ground, of course it became essential to devise some way of getting the great crowds to the other side without being obliged to cross them. The entire six or eight tracks at the grounds have consequently been raised on a substantial bed, the crossings being made beneath them.

For a similar purpose, that is to avoid disasters on the tracks, the viaduct at the foot of Van Buren Street will be erected. It is at this point that the steamship company which will run boats to the Fair Grounds has built its large pier, and to reach this pier at present what looks to the nervous stranger like almost innumerable tracks must be crossed. The viaduct, of course only a temporary affair, is to start from the Michigan-avenue side of the lake front, and after rising gradually to an elevation sufficient to allow of the passage of trains beneath will gradually slope down again onto the spacious pier that runs out into the lake and which was completed some time last summer. This particular locality seems alive with work, which, though not all destined for the special use of visitors to the Fair next summer, is being hurried forward towards completion on account of it.

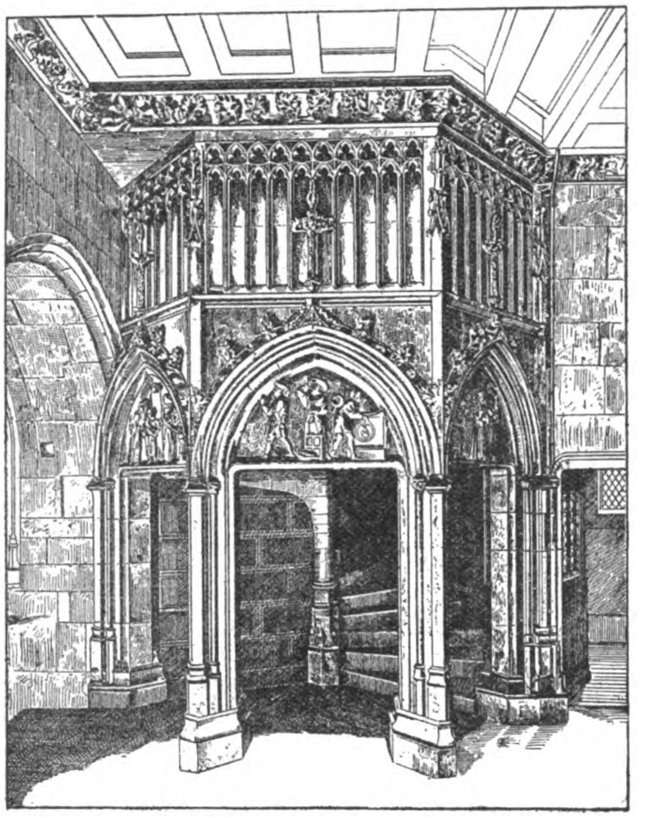
Nearly opposite the viaduct is the Auditorium Annex, a large hotel, to be carried on under the same management as that of the Auditorium itself. Apparently owing to some business scheme, a different architect from those who built the Auditorium proper has been employed on this new building. However, in spite of this fact, the two buildings have been kept in harmony with each other, as is seldom the case. The style of the new one is rather the more pleasing of the two. The material is buff Bedford stone, being the same as that used on the upper stories of the Auditorium. In that building the lower stories are of granite, but smoke, the great leveller here, has so "harmonized" the two stories that no difference is noticeable. The new building has the solid square outline so familiar to Chicago people in the Auditorium, and while the architect has kept a suggestion of the loggia and long bays, he has materially changed them. The loggia is hardly more than deeply-recessed windows, the recessed space being provided with pillars, which suggest a leaning towards the Doric style, not in keeping with the Romanesque carvings and mouldings. Should we take exceptions to this, however, there would also be a point for criticism in the balustrade of the highest of the bay-windows, where a decidedly fourteenth-century feeling is noticeable. The bays, which form a feature both in the side and front façades of the Auditorium, are, as above stated, kept in this building, but instead of the windows flush with the wall-line, as used in the older building, in the Annex bay-windows have been introduced into the bays both on the two sides as well as front and rear, which must give a delightful amount of light and sun to the rooms. The two or three upper stories of the Auditorium have their windows enclosed in a series of small bays, and to harmonize with this effect similar treatment is given to the upper stories of the Annex, the bay-windows being discontinued. In place of the flat surface of the small bays of the Auditorium, Romanesque pilasters are introduced as the dividing-line in the Annex. One feature by which light is given on all sides for the bed-rooms is the erecting of only a three-story structure on perhaps fifty feet at the southerly end of the Michigan-avenue frontage. Neither the same treatment of stories nor of the mouldings is pursued in this lower structure, and it remains yet to be seen whether it is to appear as part of the hotel or only a separate building in harmony with it.

Four or five blocks below this new structure, facing north, but still overlooking the lake front, is the new Illinois Central station. At present it is so shut-in from the general public by "no-admittance" gates that any knowledge of the details of the structure is hard to obtain. It is evidently Romanesque in feeling, and in its present state is suggestive of a good deal of picturesqueness. One most unusual feature is that, instead of being one huge pile, the station is composed of a group of three separate buildings, — four if we count the baggage-rooms, — some distance from the three others. The portion containing the main entrance is in the form of a large detached tower, while the slanting roof of the lower part of the building affords a pleasing relief from the square solidity of the corner-tower portion. The picturesque grouping is especially noticeable on the southern side, where the third detached building lies at right angles to the two principal ones. The material used is brownish Roman brick, with slate roof. The train-sheds, though very long, do not begin to equal in beauty the fine space of those of the Wisconsin Central station, recently erected here. Possibly the trusses of the World's Fair buildings have spoiled us for all else.

In last month's letter mention was made of the plan which the Board of Education was about to carry out. The matter has been definitely settled and an architect with a fixed salary of six thousand dollars has been engaged. Last year twenty-five school-buildings were erected, at a cost of fifty thousand dollars each, the architect receiving two and a half per cent for his commission. Now he draws his salary and has no expenses. The expense for the Board will undoubtedly be less than it was with the previous arrangement if all is run honestly and squarely in the bureau. All may — will — undoubtedly go right at first, but even should the head of the bureau continue to be an honest man, superior to temptation, there will doubtless be beneath him men more powerful than himself, as being the tools of prominent politicians. Such a state of things could hardly fail to bring about undesirable results, and an architectural bureau, with its contact with contractors and men of different trades, must ever be a dangerous place into which to introduce the conscience of the average politician, ever prone as it is to constitutional weakness.

BRICKS A DANGEROUS CARGO. — The captains of ships which carry brick have to be very careful. An ordinary brick is capable of absorbing a pint of water. So with a cargo of brick in the hold serious leakage may quite well go on undetected, for the water that enters is sucked up as fast as it gets in. If this should be the case the consequences are bound to be most fatal. — *The Clay Record.*

CHINESE CURIOS.[1]—I.



Spiral Stairs in the House of Jacques Cœur, Bourges. From Havard's "*Dictionnaire de l'Ameublement et de la Decoration.*"

FEW collectors in the United States are aware of the wealth of China in all sorts of oddities and curios. There is an army of connoisseurs among the rich Mongolians, but they display little or no energy in accumulating art treasures. If they see something that strikes their fancy and they are satisfied with the price, they take it without a murmur. If it be ten cents beyond what they regard as a fair limit, they walk off in high dudgeon. As a consequence, the curio market has few ups and downs. Nevertheless, it does an immense business the year through. The best patrons are naturally wealthy natives. Then come European collectors and experts. Ship-captains and missionaries are also buyers of considerable importance. Last and least are the collectors of the United States.

There is hardly an artistic taste but can be gratified in the Flowery Kingdom. A full description of the art treasures to be seen in its great cities would fill many volumes. A *résumé* may be of interest to both the collector and the reading public.

ARMS AND ARMOR.

Of the former there are 1,100 types and 1,200 of the latter. The best workmanship in this line comes from Japan, and some admirable pieces are said to be of Korean origin. The Chinese work is extremely variable in quality and character, also in price, and, strange to say, the oldest and rarest weapons are sold at prices much below the charges for more modern and less curious implements of warfare.

In offensive weapons there is remarkable variety. On the coast its soldiers are armed with the latest rifles, while in the far interior they employ the same arms as were used by the vast hosts of Tamerlane and Zenghis Khan. Taking the Empire as a whole, the student or collector can find in use to-day every weapon that has been employed within its borders since the time of Confucius. In addition to this, the mandarins and high officials arm their retinues with conventional weapons representing different periods in the history of the nation. On account of the changes wrought by time, many of these martial instruments are so incongruous as to be positively funny. Thus, for example, the Mongolian Tartars did their fighting on horseback, and one of their most formidable arms was a pole to which was attached a hook edged on the inside like a reaper's sickle. With this they would pull a rider from his steed, wounding or killing him in the action, or would hamstring the horse at a single stroke. This pole-hook is no longer used by the few cavalry squadrons of China, but is found carried by footmen in nearly all the retinues of the great nobles. It looks formidable, but when used by infantry against infantry would be about as serviceable as an Indian club fastened securely to the end of a broomstick.

A glance at a collection of these arms shows that military uniformity was almost unknown to the Chinese generals of the past, and that the armies were made up of divers elements, armed usually with such implements used in peaceful pursuits as could be used in war. A common weapon is a trident, tined and barbed exactly as are those employed by fishermen in spearing eels. Similar to this is a three-pronged hay-fork. Of equally bucolic origin is a long pole to whose end is fastened the end of a scythe or sickle. The European mace is suggested by a long-handled, light-headed hammer similar to that with which Charles Martel is said to have won his quaint name. It is obvious that these four weapons are of harmless origin. The first was the favorite instrument of fishermen and the second, third, and fourth of agricultural people.

Of the five types described there are no fewer varieties. The poles are bamboo or solid wood. They are plain, carved, or decorated with mother-of-pearl, metal, or cord. The heads are copper, brass, iron, pewter or steel. Sometimes they are silvered, sometimes bronzed, lacquered or gilt. Handsome ones are the exception and not the rule. The average retainer of a high official carries an arm whose pole is of the commonest wood stained red and whose head is of the poorest kind of cast-iron or impure pewter. Many of these ominous-looking implements of war would not stand a light blow, both head and pole breaking at a very slight shock.

I have never seen any lances. The deficiency is made up by a surplus of spears and halberds. Of these the designs are varied, running from light and efficient points and edges to grotesque and hideous shapes that would frighten more than they would hurt. At times the workmanship is admirable. A spear captured by the French from the Black Flags in Tonquin is eight feet long. The shaft is of iron-wood, round, polished and varnished, and reënforced here and there by wrappings of fine copper wire, and at the upper hand is incrusted the distance of a foot with mother-of-pearl. The end is ferruled with a large copper band, in which is set the spear-head. This is made of fine steel, six inches in length and triangular in cross-section. One face is deeply grooved so as to allow a large amount of poison. These spears are used with great skill by the Chinese. Lee-Yu, a famous bandit, could throw one through a man at fifty yards. In the Franco-Tonquin war a powerful Chinese foot-soldier drove his weapon entirely through two French infantry-men. It is claimed that the finer and handsomer spears are not of Chinese workmanship, but are made by Japanese, Korean, Anamite, and Malayan ironsmiths. How true this is, I am unable to determine.

Of halberds there is great variety, ranging from the simple lochaber-axe and pole-axe to the cumbrous and complicated masses of metal that were so common at the close of the age of chivalry. The oldest specimen was one which, instead of an axe-blade on one side, had what appeared to be a hammer-head: it would make a serviceable implement for driving picture-nails in walls near the ceiling.

In archery the Chinese have long been experts, especially those of Manchooria and Se-Chuen. Their bows are of three types: the long bow, which is over five feet in length; the short bow, which is about four feet long; and the crossbow. The strings are made of silk, of gut, or of very strong home-made twine wrapped with fine silk in the middle. Bows are graded according to their pull, the standard being 100 catties (about 135 pounds). To determine the pull the bow, properly strung, is suspended from the middle and weights hung to the middle of the string until the latter is nearly an arrow's length from the bow. Famous bowmen use bows with heavier pulls, ranging from 150 to 200 pounds, and one distinguished Robin Hood is said to have drawn a 200-catty bow (about 270 pounds). The bows vary greatly in materials, construction, decoration and finish. They are made of one or several pieces of wood and are frequently inlaid or engraved until they are true works of art.

Worthy of mention are the tiger-bows. These are extra large and heavy and are generally fastened to a framework near a path or road frequented by tigers or other large animals. It requires two men to set them, and they are so arranged that the moving of a cord stretched across the road disengages the bowstring and sends the arrow on its way. The force is so great that the shaft frequently comes out of the other side of the tiger, deer or buffalo. To insure success the arrow is usually double barbed and envenomed. On the mainland, opposite the island of Amoy, these tiger-bows are in constant use and annually kill at least fifty of these big beasts.

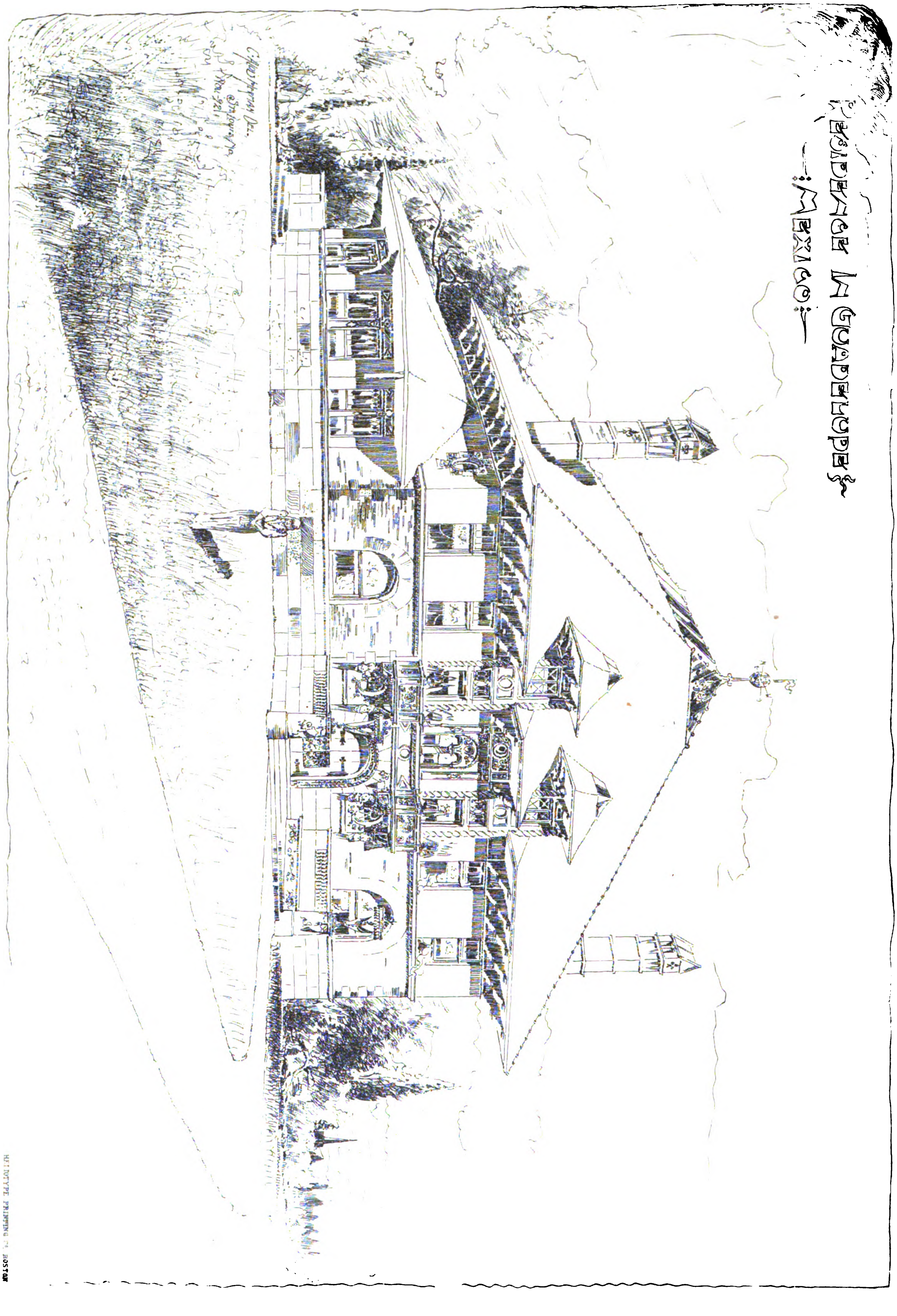
The weapons named are much cheaper than corresponding ones in the United States or Europe. The cheapest spears and halberds bring about forty cents and bows twenty-five cents. From these figures the prices run slowly upward. A handsome pole-axe is easily had for $1.00, while weapons of the highest artistic value and finish can be secured for less than $5.00 each.

A handsome stand of arms, containing pole-axes, spears, halberds, swords and daggers — two each — can be procured for about $25. A stand equally attractive in appearance, but made in imitation materials, can be had for about half that amount.

An American resident in Amoy was requested to execute a commission for a distinguished divine of the United States, a gentleman who, though a man of peace, has the finest, if not one of the best, collection of swords and other deadly weapons in the world. This led to the examination of several hundred rare and curious weapons sent him for inspection and approval. No two were alike of the lot selected, and not one that did not display rare skill on the part of the Chinese sword-smith.

The handsomest of all is a general's sabre about four and one-half feet long, slightly Japanese in style, with an edge like a razor and a point that would extort admiration from an Italian bandit. Unlike our own, the thickest part of the blade is the centre. This gives great weight to the weapon, joined to an appearance of great lightness. The scabbard is made of hard, tough wood, lacquered to

[1] Report to the United States Department of State, by Consul Bedloe, of Amoy.



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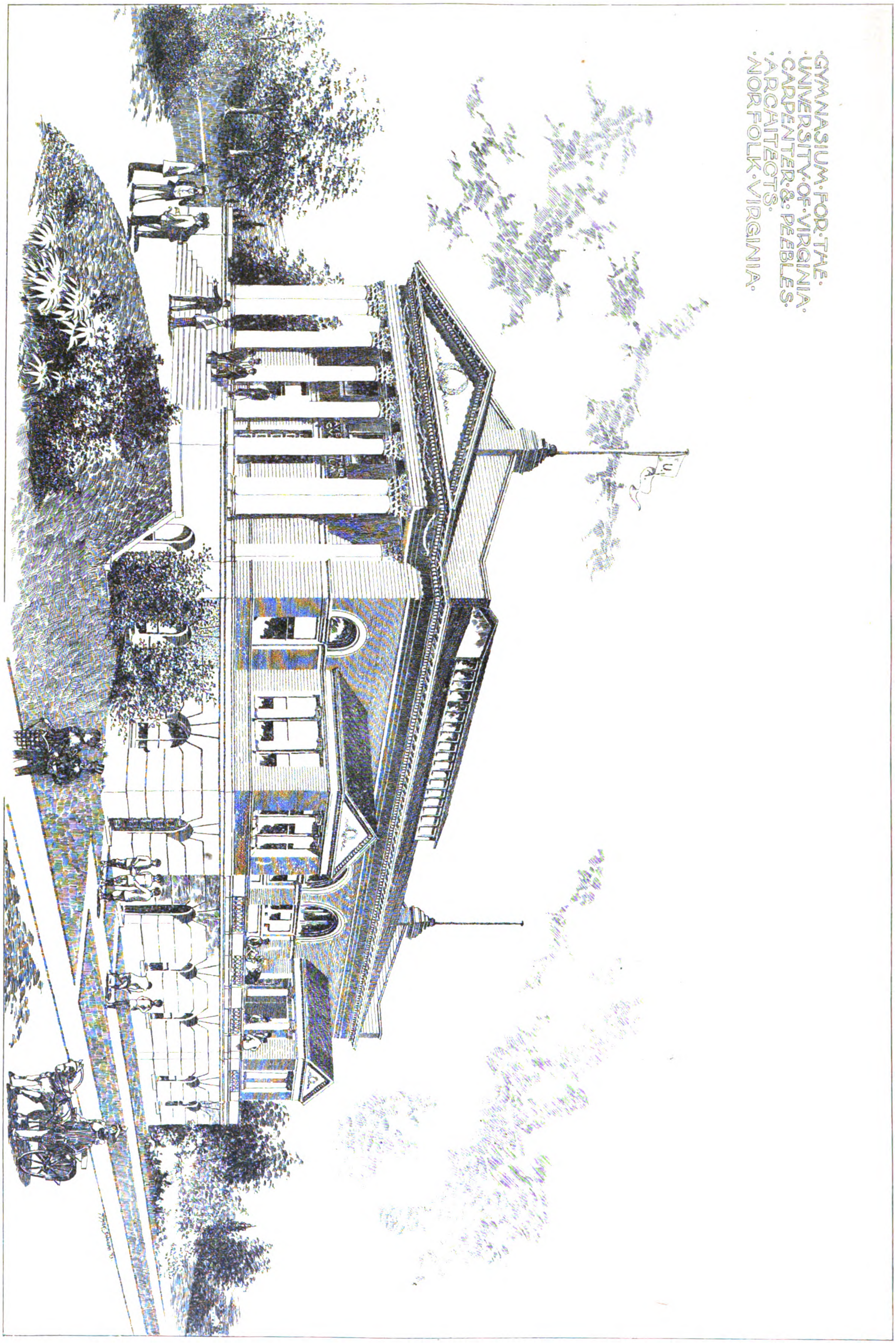
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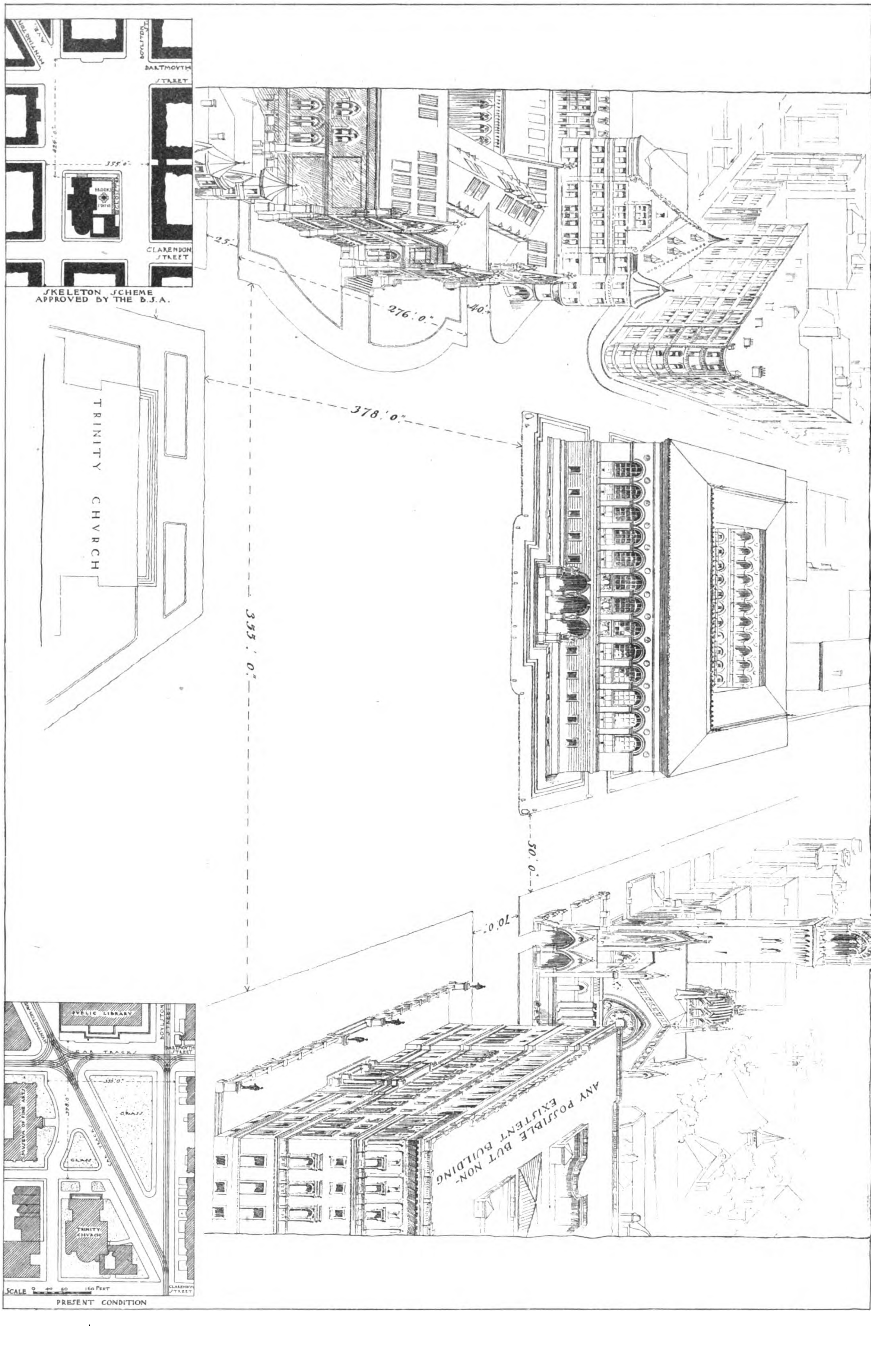

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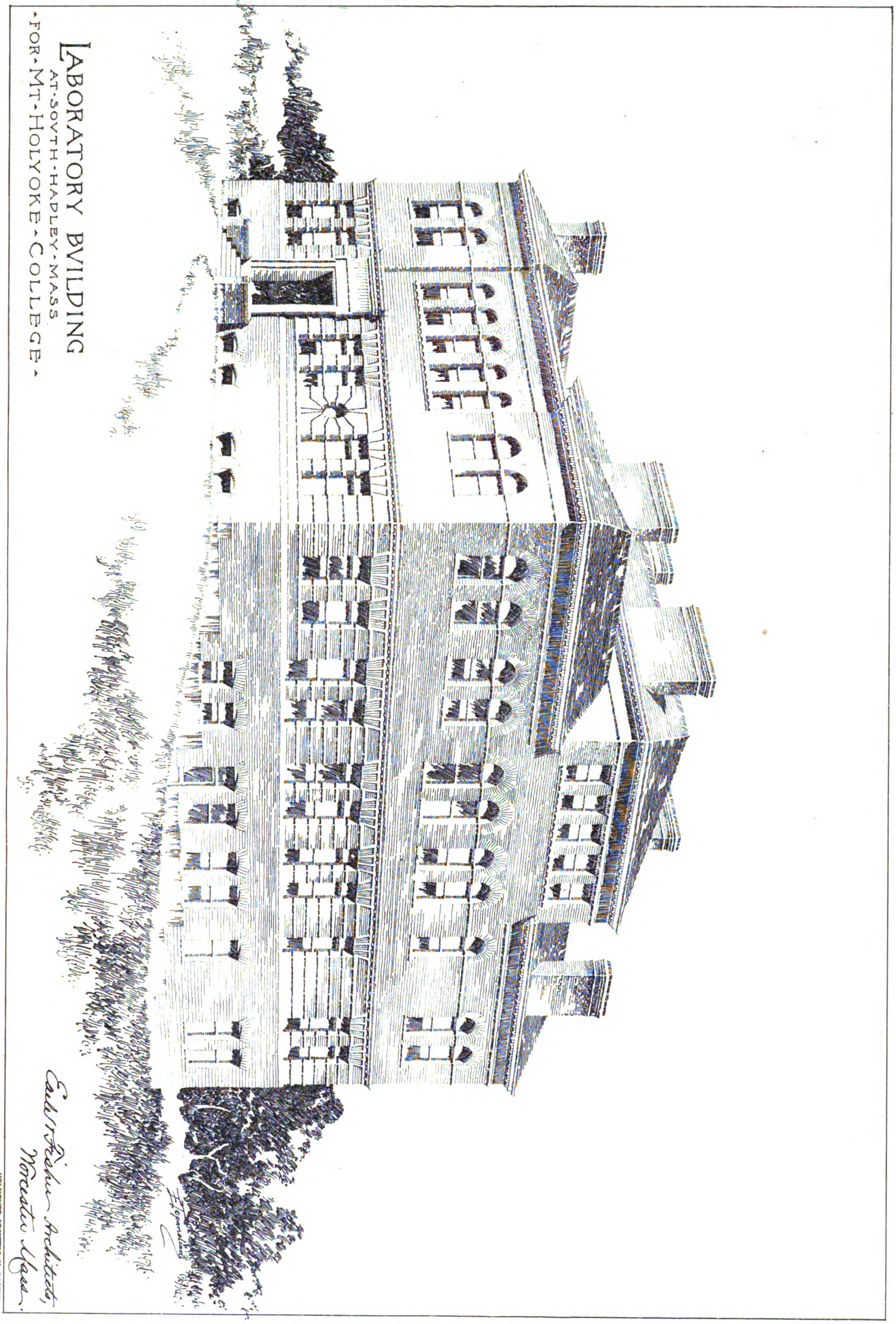
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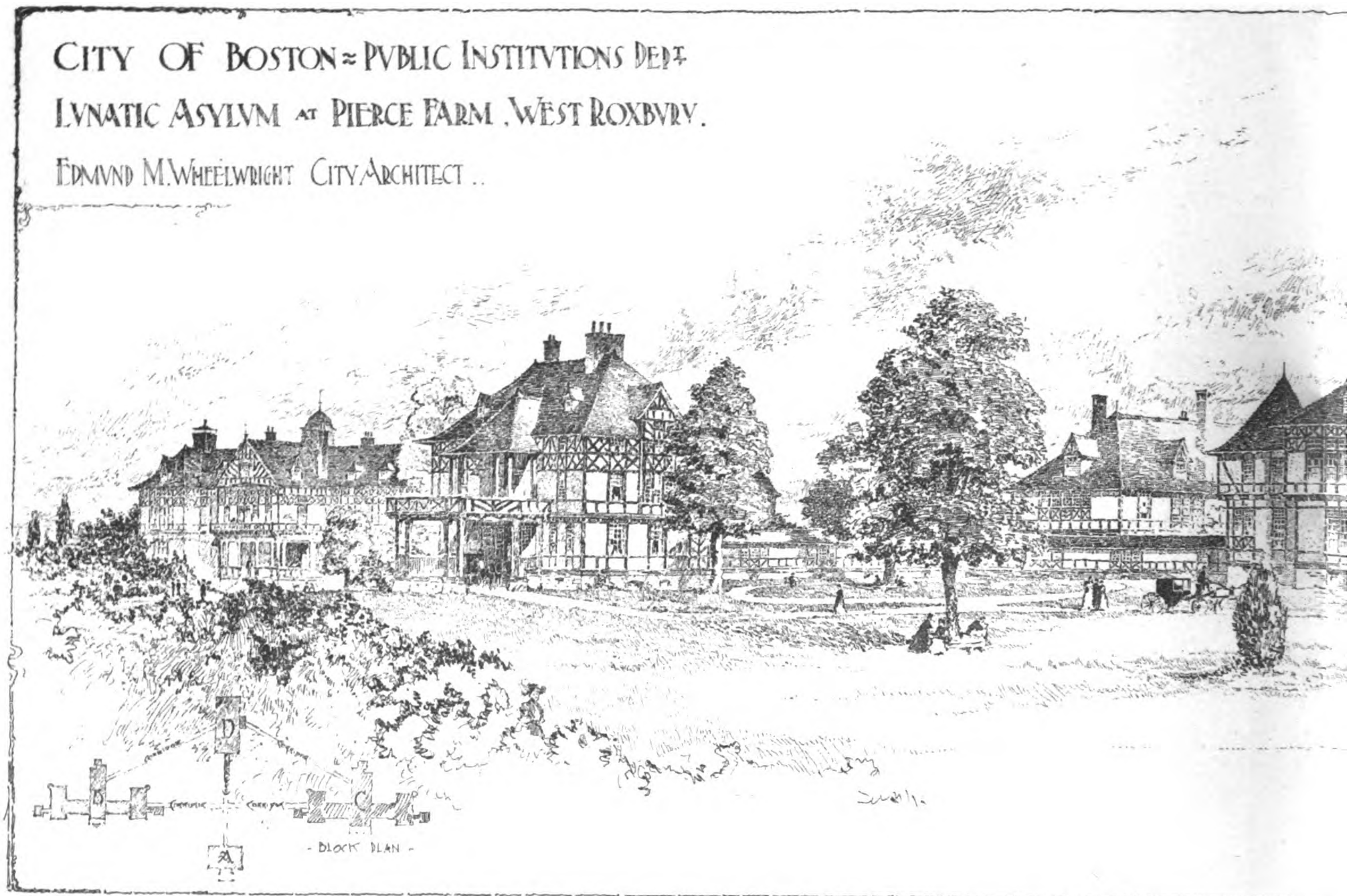

· "B" MEN'S DORMITORY · · "A" ADMINISTRATION BLDG.. · · "D" DOMESTIC BUILDING ·

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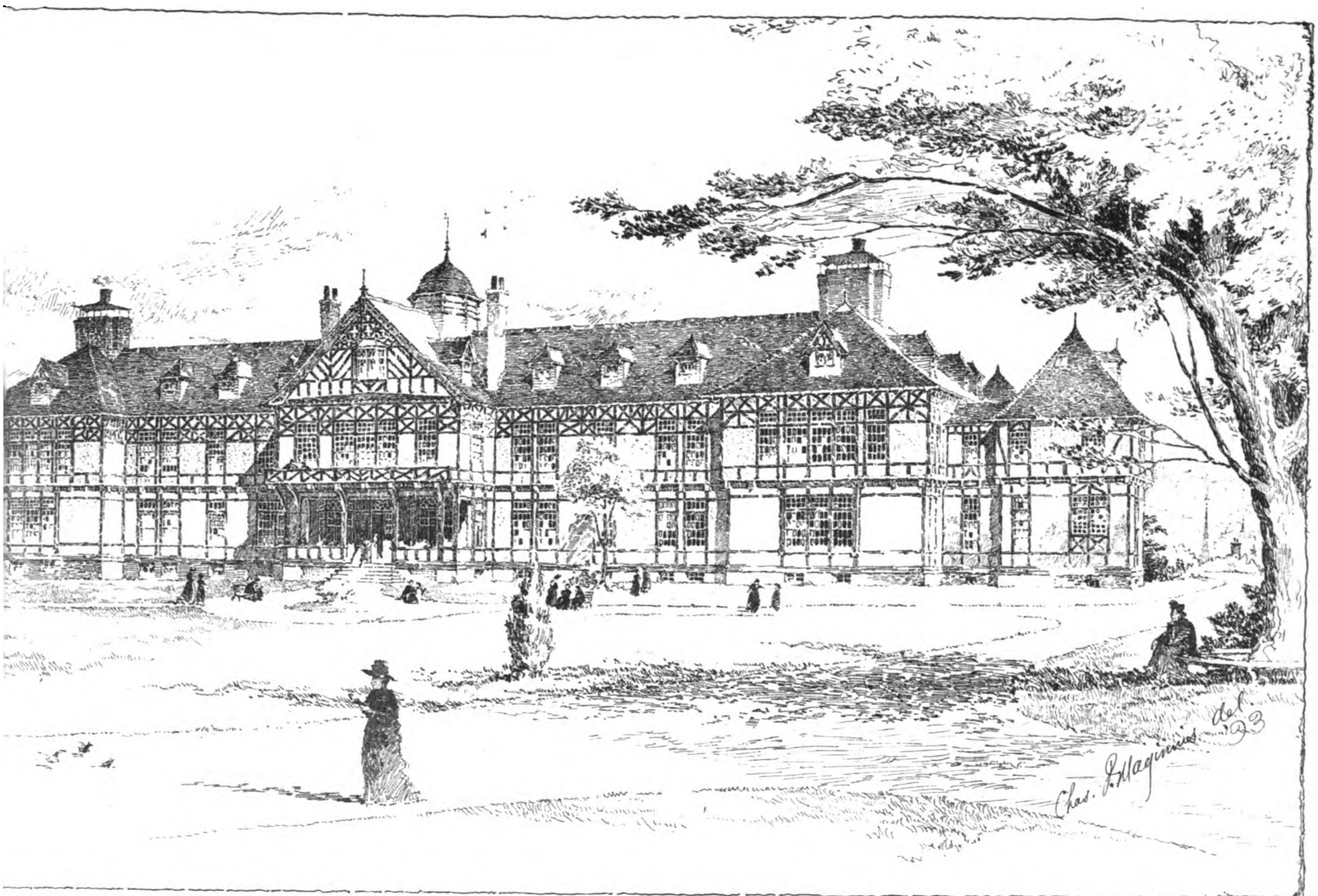


· "C" WOMEN'S DORMITORY ·

HELIOTYPE PRINTING Co. BOSTON

represent black iron incrusted with mother-of-pearl. The hilt is of black iron moulded in the form of a full-blown rose, the petals of which have been drilled with small holes and these filled with bright brass bars.

The most curious of the lot is the so-called warrior's two-bladed sword, from Ho-Nan. It is only about two feet long, and in the scabbard looks very like the sword bayonet of our own army. The scabbard is plain, but very neat, and covered with white shagreen (or shark skin) and trimmed with brass mountings. When you draw it the blade divides into two, each a fac-simile of the other, double-edged and spear-pointed. The twin blades have a remarkable decoration made by drilling seven holes about an inch and a half in diameter and put in a zigzag line from hilt to point. These are filled with pure copper, which is ground down to form a smooth surface flush with the steel and polished to a mirror-like brightness.

These seven stars, as they are called, are found in nearly all the martial weapons of Ho-Nan and are relics of the old astrologic faith that still prevails in many parts of China. Its hold is so strong that if the copper falls out of one of the sword holes it is accepted as a sure precursor of death, and the luckless wielder of the blade usually commits suicide to escape further trouble.

The short stabbing daggers, which find favor chiefly with pirates and revolutionists, form a strong contrast with the weapons described. They are generally so ugly that they would be ludicrous were it not for the purposes to which they are applied. I have one which looks like a queerly-made ace of spades fastened into a wire-bound handle. To increase the artistic effect of the weapon, the armorer has hollowed out a shallow, spoon-shaped concave on either side of the blade and filled-in with blood-red lacquer, the effect of which, when suddenly drawn from a black sheath, is very startling. Spades are not the only suit in the pack that is popular in the Mongolian mind. I have another weapon whose blade is a perfect ace of diamonds. All four sides are ground down to an almost concave edge, and the blade is made hideous by Chinese red-lacquer work made to represent drops of blood and gouts of gore. Still another dagger is about the clumsiest affair of the kind I ever handled. The blade is a foot long, about three inches wide, and half an inch thick. With its heavy brass hilt and gigantic guard it weighs over three pounds. If set with a long handle it can be used as an axe. It is used chiefly by the Black Flags and other celestial outlaws, who, in addition to using it in the ordinary manner, throw it with fatal precision. The ex-resident of Tonquin told me that during the late war he had known instances in which the knives were thrown with such force that they would go through a man's body and show two inches of bloody steel beyond his back. The handles of many of the instruments of death are finished with what we call "pistol grips."

The most dreadful looking weapon of all is the executioner's sword, used by the late headsman of Amoy. It is of Manchoorian type, being long, almost straight, very heavy, and keenly edged. It is used with one hand, and is shaped and wound so as to give the executioner a powerful hold upon his weapon. Upon the blade near the hilt are Chinese characters recording the tragic events in which it has taken active part. My interpreter told me that it records no less than one hundred and ninety-three human lives, which it has taken out of this world. This record enhances its value. A new sword of the same kind could be bought for $10 or $12, but for this sword, with its ghastly history, the thrifty broker wanted $200 cash. He evidently thought that, although it came high, I must have it, and accordingly raised the price. He was a very heart-broken creature when I declined it with thanks.

A word of caution as to these Oriental swords and daggers: Very many of them are poisoned, so that a mere scratch will cause death. The venom is produced by steeping the blade in decayed human blood, and is one of the deadliest known to physiological science.

From now on for the next five years will be the golden opportunity for the collector to secure the finest specimens of swords. The market has never before contained, and never will again, such an assortment as regards either beauty, economy, historic value, variety or workmanship. The reasons are simple enough. The opening of China and Japan to the outside world and the introduction of fire-arms was a fatal blow to the sword-smiths' industry. Before that event the makers of swords formed the wealthiest and most powerful guild in the East. The mediæval rivalry between Milan, Toledo and Damascus was insignificant alongside of that of the great armorers of the Orient. Competition caused experiments in metallurgy, alloying, forging and tempering that produced results of high value and disclosed mechanical secrets to the workers in steel that are unknown to the best cutlers of Europe and America to-day. They produced blades with perceptible tints in violet, blue, green, red, silver and gold. Saladin's sword, that would cut a veil or a cushion, and Richard Cœur de Lion's, which would sever a steel mace, could have been duplicated in a hundred shops in the days of the Shogunate and the eighteenth-century mandarins. Upon the sword, art ran mad. The smith learned to arrange the fibres of the metals so as to form geometrical patterns, the figures of flowers, fruits and leaves, and even the Chinese characters composing quotations from the great poets and philosophers. Their skill in this field bordered on the marvellous. You can obtain superb weapons even now which in the brightest light seem made from metal mirrors. Put them in the sunlight so as to cast a reflection on a dark surface, and in the illumination you will see in faint lines every pattern I have described. The effect is the same as that produced by the magic mirrors of Japan, but how it is done no one knows. The appearance of this flood of weapons upon the market is due to an additional cause. Under the ancient régime every noble, high and low, in Japan was attended by two-sworded men-at-arms, just as the robber barons of the Middle Ages were accompanied by steel-clad swash-bucklers. In 1860 there were, it is estimated, at least 400,000 "two-sworders" in Japan. The revolution of 1868 changed all this in a twinkling. Sword-wearing, except by the police and the soldiery, who had the ordinary European weapon, was made a crime. The two-sworder lost his occupation, and his tools of trade were locked up as mementos of the golden past. But twenty years have come and gone since then, the Mikadate is an established fact, and all hopes and desires of a return to the old feudal system have become mere echoes. A new generation has arisen which cares for money and not for the "hero's weapon," and the old one, which loved the blade for its past, is rapidly dying out. The consequence is that young Japan, with admirable thrift, is putting the weapons of his sires and grandsires in the curio-shops to exchange them for *yen* and *sen*, the dollars and cents of their mint. In China the mandarin has sold his grandsire's blade and carries an umbrella instead. So many have taken this course that the market is more than glutted. Two-thirds of these weapons have tasted blood. All are interesting, a majority are very handsome, while a few hundred are simply superb works of art. The prices at times are so low as to be laughable; $3.00, $2.00, $1.50, $1.00 and even 75 and 50 cents will procure a weapon such as Broadway and Strand dealers have frequently sold for $50 and upwards. The low prices have put many noble weapons to ignominous uses. Here and there in rich farming-lands the Oriental goes beyond the Biblical prediction and turns the sword into a plowshare, a reaping-hook, a pruning-knife, a carver, a poker and even a skewer. One day I saw two fishes roasting on a blade which may have swung in the great wars between China and Japan.

There is no more handsome ornament to a drawing-room or library than a trophy of arms, and of these the most attractive is a set of old Eastern swords, with their exquisitely carved hilts, their noble blades, and their fantastic yet ever beautiful scabbards.

While China cannot compare with Europe in the beauty, richness or variety of the defensive armor, it nevertheless can show many ingenious and interesting types.

The original armor of the north (Manchooria and Mongolia) seems to have been leather, and in shape was more like a blouse than a jerkin. In the course of years the skin was doubled, trebled and quadrupled, and a Chinese lower garment that might be called leather greaves and cuirasses combined was added to the upper one. The Mongolian nomads learned at an early age that a coat or cuirass made of sheepskin in several thicknesses made a very warm garment and would turn a spear, arrow or sword. Apparel of this class is in use to-day and may be bought very cheaply in Shan-Toong. Parallel to this alternating of leather and wool in the north was that of paper and cotton cloth in the south of China. It seems ridiculous to call such combinations armor, and yet they make an armor superior in many instances to steel. Thirty thicknesses of alternate calico and paper will resist a pistol bullet or one from a rifle at a distance of one hundred yards. A spearman who thrusts his weapon into a man clad in this kind of garment can neither wound his enemy nor extract his weapon, and, if the enemy is an archer or is armed with a long sword or javelin, he is likely to lose his life for his mischance. The suit of a famous Yun-Nan bandit consisted of sixty thicknesses of cotton cloth and paper and made him practically invulnerable. These suits are comparatively light, are very durable, and, of course, extremely cheap. Between these extreme types lie many kinds of plate, scale and chain armor. Plate-mail never reached a high development in the far East. I cannot find that it ever passed beyond the combination of breast-plate, back-plate and shoulder-pieces. Scale-mail, on the other hand, at an early period was carried to a high perfection. The scales were applied to cloth or leather at first as spangles are to gauze and later as tiles or slates are to the boards of a roof. They were composed of iron, pewter, silver, gold or of various Oriental alloys. In making a suit scales of one kind were usually employed, but combinations were frequent in which metals of contrasting colors were used. A good suit of armor can be bought at prices ranging from $10 to $150.

Of the different pieces of armor the helmet alone deserves attention. The Chinese artist worked along a different channel from his European colleague, and tried to make the headpiece monstrous and terrifying rather than protective. Designs representing the jaws of serpents, griffins and dragons are very common, but such affairs as the barred and vizored helmet which Doré loved to draw are entirely unknown. Morions and skull-caps were also in general use and are to-day. The queerest type of all is the executioner's helmet. It resembles a high mouse-trap or fly-trap in wire and painted the conventional vermilion. Centuries ago the wires were flat and so arranged as to defy sword and axe, and, owing to their great height, disconcerted the archers of the opposing army. In the north, where wood is scarce, the helmet is made from woollen cloth, leather and metal; in the west, where there are forests, wood was frequently employed; while in the south, in addition to these materials, cotton cloth and paper were also used. Helmets vary in cost according to workmanship and materials, and range from fifty cents to $50.

Shields and bucklers have been in vogue from time immemorial. The favorite type is a bossed circle from two to three feet in diameter

similar to those employed by the Highlanders. Its composition is leather, metal or woven split bamboo. Bamboo shields are very strong and durable. They are made of a certain variety of that vegetable, which must have attained a certain size and hardness of fibre before it was fit for this particular purpose. The bamboo is split into pieces an inch in width and four feet in length, softened and braided in basket-work over a frame the size of the desired shield. It is dried in the sun and then in a kiln, and afterwards polished and varnished. Its great strength and elasticity and lightness render it an admirable weapon of defence. A double thickness of bamboo with metal rim makes a buckler unlike any to be found elsewhere, and costs fifty cents. Unlike at home, the new weapons cost more than the old. Antiques can be had for a third or a fourth of the cost of new reproductions. Rich men in China prefer cheap imitation to originals, whether new or old, and the curio market scarcely knows armor as an *objet de vertu*.

[To be continued.]

SKETCHES OF ITALIAN ARCHITECTS.[1]

PALLADIO.

Hunting Trophy: by Stefano della Bella. From *Der Formenschatz*.

ANDREA PALLADIO, of Vicenza, in the course of his long career, probably erected more public and private buildings than have ever yet owed their design to any one architect.

Mr. Gwilt has given the sanction of his high authority to the assertion that Palladio's works were models for all the countries of modern Europe, and that in them the style which bears his name has had no rival. "So true is it," he observes, "that there is always to be found room for a man on whom nature has bestowed the faculty of seeing, feeling and thinking for himself." The extraordinary success which attended the career of Palladio, and the great extent to which he was able to control and modify the taste of his time may, perhaps, be better understood by a brief reference to the condition of society at the time when he appeared on the stage; for the observation is certainly entitled to credit that, "in the case of the architect something more than genius is necessary." It is requisite that circumstances should exist by which his art may be developed, or, in other words, that what he is capable of producing should be suitable to the wants of society at the time in which he may live. There is no doubt that many fine and sensible conceptions have been lost to the world for the want of taste to appreciate them or of opportunities in which to put them in practice. But circumstances of the kind most favorable to architecture had existed for a long period in Italy up to Palladio's time. The rich and the great had, in fact, been contending with the governments which should be the greatest patrons of the art; hence sprang the multitude and variety of works which still point out the greatness of the Italian States (now United Italy). But on account of the political condition of Venice, as well as on account of the particular period when Palladio rose to fame (which was about the middle of the sixteenth century), he cannot be said to have enjoyed those extended opportunities for signalizing himself which had proved so great an advantage to many former masters. Still, Venice had risen into power and wealth by her arms and commerce, and, although the works she required were not on a scale of the most grand and regal dimensions, yet those which her citizens required were likely to keep pace in luxury with the increasing wealth of the families who erected them. This was the peculiar nature of the career which remained open to the genius of Palladio. It will readily be conceived that his art was not called upon to furnish churches of colossal dimensions, nor palaces for sovereigns, nor immense public monuments left for posterity to finish and, perhaps, to pervert. Fortunately for the talents of Palladio, the political state of the country furnished a numerous class of wealthy citizens, who contended for the aid of this great man in rearing a villa or a palace — which might serve the double purpose of a present dwelling for the family, and a future memorial of their consequence. This was the feeling that found full scope in Venice, that covered the banks of the Brenta with edifices, which, of their class, form a complete school of civil architecture. They sprang up on all sides, under the same controlling hand, and thus the industry of Palladio was obliged to keep pace with the wonderful fertility of his invention.

The architectural taste of this great artist has been observed to be tempered and modified in no small degree by the care which he bestowed on the convenient arrangement of his structures. No one has exceeded him in the pains he took to accommodate external beauty to interior convenience; in suiting the art to the wants of persons with moderate means, through the medium of greatness of manner without extended dimensions; and richness of effect without a profusion of outlay. In the imitation, or, rather, appropriation, of the architectural system of the ancients Palladio truly excelled in that manner which selects from the skill of past ages the ideas best suited to the wants of his own time; he felt it was his calling to adapt his art to the wants and uses of the age in which he lived. No model, however perfect, was held up by him as an invariable copy or propounded as an infallible test. With him architecture was not a blindly imitative, but an inventive and an intellectual, art. Thus he acquired that just medium of exactness without pedantry, of severity without harshness, and of freedom of manner without abuse, which has made the architecture of the ancients so popular, and so modified it as to be practicable and convenient in all countries. We, too, have now learned to understand that it is the elements, and not the precise and rigid combinations, of Grecian architecture — changed, as they have been, by a passage through an intermediate existence in the schools of Italy — that can give us a natural, vigorous, unaffected and beautiful style. "No architect," says Mr. Gwilt, — and I know not where we are to look for a higher authority than this elegant scholar, — "can consider himself thoroughly educated who has not studied the works of Palladio.

The admirers of Palladio are sometimes charged with lacking an appreciation of the beauty of the Grecian outline. But this is not the case, — nothing could in reality be farther from the truth. Had one been born an Athenian the glorious temple of Pericles would have been the chief idol of one's imagination; but living in another country, a different climate and a distant age, one can only view it in the light of an example, not as a model for a flimsy dwelling-house, or a pattern for a brewery. Its unity, expression, harmony, fitness and extreme simplicity teach that the Greeks adapted their architecture to the demands of propriety and of common-sense, and the lesson thus derived is that we should endeavor to do likewise. The materials of classic taste are all supplied to the architect from the exhaustless storehouse of antiquity; the rules which guide, but not fetter, the artist, are before him, but the combinations which are to meet his own uses must be *his own*.

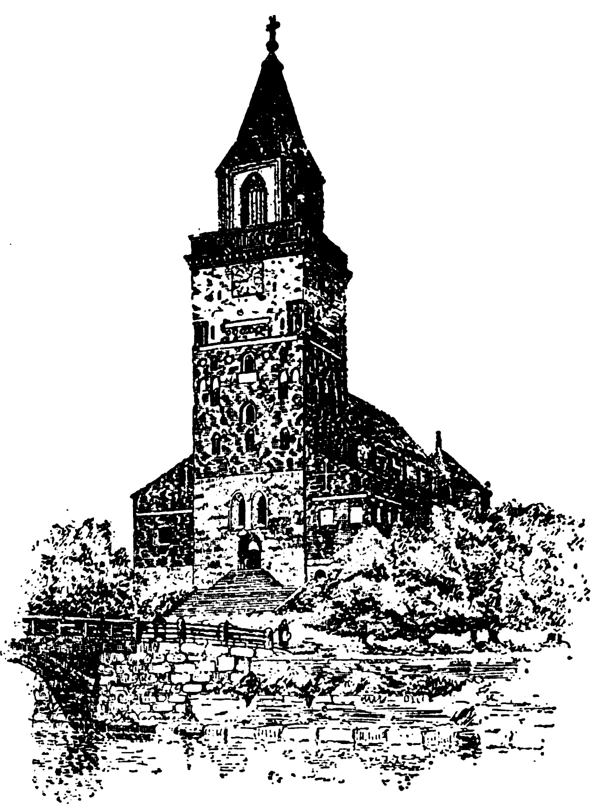
Thus, doubtless, reasoned Palladio, and thus it is that his name attained the proud eminence which it has always continued to occupy. It must have been by the observance of such principles that his peculiar properties of taste and style resulted. The utmost naturalness and propriety pervade all his works, in their adaptation to the uses of their erection. Suited, as most of his examples were, to the means of moderate fortunes, they found in England — if such an expression may be pardoned — a second native country, where those great masters, Jones, Wren and many others, have naturalized the plans, façades, distribution and details which were originally planted in the provinces of the Venetian republic. Indeed, the fascinating style of Palladio could not be prevented from spreading throughout Europe as a true happy medium between the severe use of ancient forms and the irregular license of those who reject all rules whatever. It only needs for the public to acquire architectural information to perceive that the architecture of the Venetian school is ancient architecture practised upon principles of common-sense, and since the outline and disposition of the works of the ancients must necessarily be changed, to fit them at all to our purposes, changing also the component parts of which they are made up so as to accommodate them to their new situation. Thus Palladio did not scruple to vary the proportions of an order according to the nature of the building to which it was applied or the peculiar position in which he might be obliged to place it. For example, the fine Corinthian portico of the Pantheon, at Rome, lost much of its effect by being necessarily placed on the north side of the rotunda, so as to be constantly *in the shadow* of the larger mass. This variation of situation was a departure from the usual practice of the classic architects, who generally placed their porticos in such a position as to receive the full benefit of the strongest light upon which their effects, so far as light and shade are concerned, will be found mainly to depend. Now Palladio, when obliged, from a difficulty in the site, to submit to such an inconvenient arrangement, would have taken care to exaggerate somewhat all the profiles of the component parts which would have the effect to deepen the shadows in that situation, and thus restore, by simple artificial means, the advantage which he would otherwise have been compelled to lose. A parallel expedient is found in the practice of our sculptors, who deepen their lines and

[1] From the papers of the late Arthur Gilman.

cuttings on a bust in marble, to avoid the weakness of shadow that would result if these were not more boldly developed than in the original models in clay. Palladio's practice exhibits the result of an artist's venturing to *think* for himself, instead of blindly copying the mere detail which he may happen to find in the example before him. So in the law, too, the advocate takes the broad and general principles of his argument from the precedents which he finds laid down in the books, but they must be varied in their application to suit the new circumstances, or to apply to the novel combinations of his case. "Thus the buildings designed by Palladio," says Mr. Gwilt, "exhibit great good sense, simple means of accomplishing the end, a satisfactory agreement between the demands of necessity and those of pleasure, and such a harmony between them that it is hard to determine which has submitted to the other." I do not think that the characteristics of his style could be better described than in this perspicuous quotation. That Palladio had faults it would be useless to deny, for no architect can ever be expected to reach absolute perfection. These faults, often resulting, too, from circumstances over which the artist could have had no control, have been magnified by modern critics into evidences of his ignorance and incorrigibly bad taste. But it is beyond dispute, that everything must find its own level at last, and the system which is based upon convenience, reason and common-sense will, in the end, prevail. The style in question has already almost entirely superseded the use of Grecian details in France and England, where the attention paid to architectural science is so much greater and the means of patronage so much more ample than among ourselves. This, I think, every one will be willing to confess, without sacrificing that national pride which is so highly natural and commendable a feeling; and it is not too much to say that we should be wanting to some degree in self-respect, as well as in a due regard for the advancement of the arts, if we were willing to remain in the same state of supine inaction.

We annually, as a nation, expend a great amount of money too, — both on our public and private edifices, — and is it not time that those who are called upon to pay for these undertakings should qualify themselves to understand, in some small degree at least, the real value of the return which they receive for their outlay? So well based upon the practice of the ancients does the style of Palladio appear to be, that it is, with but few modifications, suited to all nations, and just such as the ancients themselves would have adopted. There can be no doubt that had Ictinus, the designer of the Parthenon, been called upon to furnish a residence for a gentleman of Venice, — if such a thing could have happened, — he would have followed precisely the manner of Palladio: both were guided by reason and fitness in their works; and the character of these accordingly varies only according to the difference in the circumstances to which they were severally adapted. It has been said that if Plato were alive at this day there is no class of men for whom he would entertain so hearty a contempt as the professed Platonists of modern times. Instead of following out their great master in his search for truth, they are content to stop short exactly where Plato, in his day, was obliged to leave them. Just so is it with our modern Grecian architects, — instead of applying the principles of the classic style, they only reconstruct copies of its examples, and think that by multiplying Doric porticos they are really reviving Grecian art. But in thus transcribing specimens they violate first principles; and it may safely be declared that Ictinus would faint at beholding the productions of his modern admirers. In modern Grecian designs architectural features are continually tacked onto buildings with which they have no possible concern, merely to make up a show. Thus it is not an altogether unheard-of thing for two estimates to be made of the cost of such a building, — one estimate of the house without the architecture, and the other of the architecture with the house. Instances have occurred where one man has taken a contract to build the house, and another one contracted to build the architecture; and when both were finished the architecture was found to be too large for the house, and had to be considerably cut down and modified before it could be fitted to its place. One would not advocate a literal adherence to one of Palladio's plans in all its parts, any more than to that of an hypæthral temple of antiquity. Convenience changes as the modes of life vary. It is in the manner in which Palladio and his school used the system — the way in which they disregarded the letter, in order to adhere to the spirit of it — that they afford us an example, but their invention in details is at least of direct use, and these can be well applied without any variation among ourselves. The number of palaces and villas with which Palladio enriched the Venetian and Vicentine territories is almost incredible; the variety of plan and elevation in them seems as inexhaustible as their number. In these, it is not pretended that there is not much that does not conform to the manners and customs of our own day. The architect made his arrangements with relation to the age in which he lived; he could not foresee the taste of posterity, nor, could he have done so, is it likely that he would have been permitted to make it a consideration by his immediate employers. But his rising to such high eminence, together with the number and great variety of his engagements, is a sufficient proof that *they* at least obtained from him all that they required. One of the most noted of his villas was the Villa Capra, designed on a scale of great dignity. It was a square house with a basement, a very high principal story, and an attic story above, communicating with the lower apartments by stairs placed in the angles which were cut off by a great central rotunda. This rotunda terminated inside in a hemispherical dome. There were four principal rooms on each floor and four smaller intermediate ones attached to them. There were also four fine porticos on the exterior, — one attached to each façade of the structure, — displaying in each six columns of the Roman Ionic order. The entablature which these supported was continued round the whole of the building, indicating the line of separation between the principal story and the attic above it. Elegant statues were placed at each angle and on the apex of each pediment, and the ornate character of the whole was kept up by the richness of the dressings round each aperture in the principal story. An imposing flight of marble steps led to each portico; and here, also, statues terminated the advanced portions of the balustrade. In this design Palladio appears to have had the noble style of the ancients always before him, and thus to have preserved that simplicity and majesty in his structure which, in spite of its admitted blemishes, it possessed in a high degree. Palladio's best church was that of Del Redentore, at Venice; there was also a theatre at Vicenza, built upon the ancient model for the Olympic Academy, which added much to his reputation. He was never employed upon any stupendous structures; for these opportunities were rare; but, had an opportunity been afforded him on a grand scale, there is no doubt that his simple and majestic taste would have achieved a triumphant result. The unity and dignity of design in the Villa Capra show that Palladio would never have tolerated many of the littlenesses that mar the beauty of St. Peter's. Many of the designs of Palladio were left, at his death, to the Senator Contavini, his friend and patron; but the Senator himself dying soon after, his designs were variously dispersed. Many of them subsequently became the property of the celebrated architectural amateur, Richard, third Earl of Burlington, who was a great admirer of Palladio, and who built a villa at Chiswick, in imitation, though not an exact copy, of the Villa Capra. This charming residence passed into the possession of the Duke of Devonshire; and the Emperor of Russia was entertained there by his Grace, in a style of unusual magnificence. This house was one proof, among many, that the public and posterity — the true judges of human merit — have awarded that position to the genius of Palladio which his various noble works so justly deserve. The death of this great artist occurred in 1580.

THE TOWER BRIDGE, LONDON.



Abo Cathedral, Finland.

A CORRESPONDENT of the *Glasgow Herald*, in describing the Tower Bridge over the Thames, says that although it might be dwarfed by comparison with the immense cantilevers which span the Forth, it is in some respects almost unique, embracing three of the principal types of bridges — suspension, cantilever and bascule. Bascule bridges, under which category it comes, are very common wooden structures in Holland, especially in connection with the Amsterdam Canal, and the wooden spans over the Forth and Clyde Canal suggest the same type, but nothing of the size of the structure at the tower has ever been attempted. The length of the bridge and abutments is 940 feet; with the approaches

the length is half a mile (2,640 feet). The approaches are 70 feet wide, being gradually reduced to 60 feet, and finally to 50 feet over the central span. There are three spans, the two side lengths, each 270 feet clear, being on the suspension system, and the central span of 200 feet between piers is on the bascule principle, with two high-level footpaths. That is to say, the main span is in two equal halves, each pivoted in the piers so that they can be raised by hydraulic machinery, assisted by balanced weights, to a vertical position against each pier, and thus allow vessels of any height to pass. When in the horizontal position, and forming the bridge, the height from water-level is 29½ feet, so that the great majority of craft can pass under. Indeed it is expected that the bascules will not require to be opened more than from thirty to forty times in each twenty-four hours. When the bascules, or draw-bridges, as they may be popularly called, are up, passengers have the option of climbing a stair or being raised by hydraulic hoists to the two foot-bridges which stretch from tower to tower at a height of 140 feet from high-water level, and this alone prescribes the height of ships' masts. There is little chance of this ever being exceeded. The view from the foot-bridge, it may be said in passing, will compensate for any inconvenience.

In describing generally the method of construction, attention is naturally turned first to the foundations. Besides the two abutments on the shore there are two piers, 270 feet distant from each abutment and 200 feet apart. Owing to the requirements of the river traffic, only one pier could be constructed at a time, and that on the Middlesex side was started in 1886, when the foundation-stone was laid by the Prince of Wales. The high-pressure closed-chamber system of driving underground being so common, it is interesting to note the different methods adopted by the contractor, Mr. Jackson, in sinking the foundations. Eight rectangular wrought-iron caissons, 28 feet square, and four triangular-shaped caissons were constructed on staging in the river and lowered into position on the bed of the river. The excavation of the material inside the caissons then proceeded by means of grabs or buckets on cranes, while divers shovelled out the material from the sides. The caissons had a cutting edge, and, being weighted at the top, sank as the excavating proceeded. New temporary sections were added to keep the top above water-level. At 19 feet below the river-bed the London clay was found, and when 4 feet of it had been penetrated it was thought safe to pump out the water, so that further operations inside the caissons were pursued in dry ground. The foundations are carried 7 feet into the London clay-bed, so that the depth from river-bed is 26 feet and from high-water level 112 feet 6 inches. Around the outer edge at the foot, too, the clay was excavated and concrete substituted from the interior through high-pressure jet. The interior of the caissons was filled with cement concrete to within 2 feet of the level of the bed of the river, when gault bricks were substituted. The caissons were separated the one from the other to the extent of 2 feet 6 inches, but piling was driven to enable the work to be done in these intervening spaces. After the inside of the caissons had been filled with concrete the intervening spaces were similarly filled, the whole site of the foundation being thus of concrete and the top of permanent caissons Cornish granite, outer walls and inner packing of gault brick, carried up from the level of the bed of the river to 4 feet above Trinity high-water mark, or 116 feet 6 inches above the bottom of the foundation. Spaces were left in the interior of the pier for accumulators for the working of the hydraulic-hoists, for a recess into which the short balance-weighted arm of the lifting bridges will fall as the bascules are raised, and chambers were, of course, provided for machinery, which is in every respect in duplicate. The completed piers are, at the bottom, 204 feet 6 inches long in the central line of the river and 100 feet wide, while at high-water level they are 154 feet 8 inches long — there being immense breakwaters — and the width is 70 feet. The sectional area of waterway is 20,040 square feet, whereas at the London Bridge it is 19,300 square feet.

Coming now to the superstructure, it may be stated that it was all made and temporarily erected at Sir William Arrol's Dalmarnock Road works before being sent to London, Sir William being the contractor for the superstructure. On the piers we have just described there were erected a series of octagonal built-up steel columns, each firmly secured on immense granite beam-blocks. These columns, which are 119 feet high and 5 feet 9 inches in diameter, are well braced together. At three heights there are landings of steel plates carried on girders, and connecting these landings are flights of stairs and two large hydraulic-hoists in each tower. Londoners have had opportunities of seeing, and therefore appreciating, the great strength of these steel towers; but even the affording of this guaranty would not atone for the unsightly effect of the steel skeletons, as gaunt-looking as those on the Forth Bridge which so offend the artistic eye, and one can appreciate the great advantage of having the steelwork cased in rock-faced granite. The main architectural features of the design of the Tower of London, close by the bridge, have been adopted in these immense masonry towers, which rise, with their little turrets of Portland stone, to a height of over 200 feet above water-level. With the subdued tone which time quickly gives they will assimilate with the venerable and historic tower.

The draw-bridges which project from the bottom of these towers, meeting in mid-stream, may be easily mistaken for an ordinary iron span of 200 feet. Each is made up of four longitudinal girders, the depth being greatest close to the tower to give the bottom a curve, with cross girders between, carrying the roadway. But the two parts are not jointed at the centre, and instead of terminating at the towers, each is pivoted to an immense "pin" on the respective towers, which alone weighs something like 26 tons, and the steelwork is continued into the interior of the pier for a distance of 49 feet. The inner arm is fitted with a ballast-box containing about 300 tons of lead, to counterbalance the outer arm, which carries the roadway. The weight of each leaf, including the counterpoise, is 950 tons. It is an easy matter for the hydraulic machinery to raise from a horizontal to a vertical position this great girder, counterpoised on a pivot. This is done by means of an enormous quarter-circle rack fitted on the inner arm, the general operation being pretty much that which may be seen any day at the wooden bridges on the Forth and Clyde Canal, but the rack is of necessity worked through gearing by hydraulic-engines instead of by hand. The projecting arm rising to a vertical position lies close against the tower, and thus admits vessels passing, affording them a headway of 140 feet above water-level. Vehicular traffic is stopped for the time, but passengers, by going by hoists or stairs, reach either of the two high-level footways, 12 feet wide.

The footways are on the cantilever principle, and the building of them excited no little interest, for, as in the case of the Forth Bridge, the work was started from each tower, the girder being thoroughly anchored down to each steel tower. The bridge was built outwards into space, — the two ends advancing to meet each other having no visible support, — and the spectacle of men working with heavy cranes at a height of 140 feet above the river under these conditions was new to Londoners. The cantilever arms are 60 feet long, with a central span of 120 feet, carried by steel rods from the ends of the cantilevers. The girders were so carefully measured and constructed that when the joint came to be made in the centre the two halves were only an eighth of an inch apart at a temperature of 60° F.; and of course on a slightly warmer day the expansion of the metal proved sufficient to enable a thoroughly close joint to be made. The expansion-joint is not in the centre, but, as in the Forth Bridge, is where the central span is suspended.

The two side spans connecting the shore abutments with the river piers are on the suspension principle, and for this purpose towers have been erected on the shore abutments, which, although not so large, are of similar design to those in the river and already described. The roadway is carried on cross girders, 18 feet apart, suspended by steel rods to the "chain," which, as in all suspension bridges, extends from tower to tower. The "chain" is built-up of upper and lower booms, with strong bracing, and is practically of two links, the one 106 feet 6 inches and the other 190 feet 6 inches long, the former link being that connected to the shore tower and anchored in a huge bed of concrete in the ground beyond, and the latter reaches up to the tower in the river. Horizontal tie-rods are provided for each chain to counteract the pull of the chains on the towers. These rods are 301 feet long and built-up of eight thicknesses of plates 1 inch thick by 2 feet. On the girders, which are suspended by rods to these chains, a corrugated floor is laid with the usual roadway, which is 60 feet wide. The suspension bridges on each side of the river are alike, and are at the towers 27 feet above high-water level and at the abutments 20 feet, so that the rise in the 270 feet is very gradual. Indeed, the steepest gradient is only 1 in 40, which is very much better than at London Bridge.

BOOKS AND PAPERS

JUST as in former years, I have recently made a visit to those publishers who ordinarily lay before the eyes of amateurs a choice of many fine books, amongst which those dealing with art most particularly concern us. Unfortunately, this year there is in France a real crisis in the publishing business, and New Year's has seen disclosed few novelties, especially in the way of costly books. Included in the Bibliothèque de l'Enseignement des Beaux-Arts, which now numbers more than forty volumes, I will mention two new works: "*L'Archéologie Chrétienne*," by André Peraté, and "*Les Styles Français*," by Lechevallier-Chevignard. The first of these books is a study of the origin of Christian art, and is limited to the consideration of Occidental art, of which Rome was the centre, and hardly covers more than the Carolingian epoch. Nearly half of this work deals with paintings in the Catacombs, which for so long a time have been the objects of the liveliest religious polemics. The author considers the art of the basilicas, architecture and decoration of Christian buildings; then, taking up the composition of Christian mosaics, he traces the development of triumphal symbolism and the persistence of antique modes in the mosaics of the fourth and fifth centuries. Finally, he reviews the mosaic-work of the fifth and sixth centuries — Rome, Naples, Milan, etc. — down to the epoch of the decadence in the seventh, eighth and ninth centuries. The last portion of the book is consecrated to miniature-painting and Christian sculpture, based on studies of statues, sarcophagi, carved ivories, engraved glass, painted and decorated glass, lamps, jewelry, medals, etc.

Under the title of "*Styles Français*," M. Lechevallier-Chevignard lays bare the principal transformations of artistic sentiment which have occurred in our country. For this purpose he has asked his

questions of all the arts relating to design, without excepting the most modest ones, for the simplicity of the means or the humbleness of the material does not detract from the beauty of the resulting work and the evidence of its origin. A fragment of thirteenth-century woodwork or a Renaissance pewter pot will as surely show to what period they belong as the most imposing of our cathedrals or the Louvre of the Valois. This work might be criticised for being rather concise. The author himself foresees this criticism, and demands whether, in an essay of this kind, conciseness is not indispensable, and whether it is not at times a good thing to disembarrass oneself of special analyses, so as to take in at a single look the progress of art under those circumstances which have hampered or helped it. Such as it is, this book must awaken in the mind of the reader a desire to have access to more complete studies, and this, in truth, is the real object and purpose of the Bibliothéque de l'Enseignement des Beaux-Arts.

A city like Paris interests us because of its general aspect, and because of its monuments. It must also interest us because of its worst side; and just as at the theatre what takes place behind the curtain and in the green-room always excites curiosity, so the organization of Paris, its by-paths and processes of administration, can give rise to many interesting studies, which may also be instructive and philosophical. This is what M. Paul Strauss, municipal councillor of the city of Paris, has undertaken, and his work has earned for his fine book, "*Paris Ignoré*," an enormous success. If I speak of this work, it is because it is not altogether without value to the architect, as might at first sight appear. When one is called on to build markets, offices for the tax-collector, town-houses, prisons, etc.,— in short, everything which comes under the classification of public buildings,— is it not indispensable to know the practical needs which the building is to satisfy, the services which it is to house, and even the manner in which those services are discharged? Many little details are neglected in drawing up an official programme, often neglected as of too little moment; yet if the architect does not take upon himself to make the necessary investigations, he runs the risk of committing those blunders which are never discovered until the time has come to make use of the building. M. Strauss's book, then, has this special value, independent of the general interest which it presents. Everybody will read with interest the account of those services which he is called upon to prepare for.

How many things are found to be unknown! When the public to-day complain of the bad condition of the sidewalks, what must one have said in the times of Philip Augustus? This good king, having placed himself at the window of his palace, to see pass the chariots which were crossing the city, could not endure the fetid odor which disengaged itself from the mud stirred up by the wheels. This gave him the idea of lining the principal streets with strong stone. From that starting-point, street-paving has made considerable progress. To-day the streets of Paris are paved in four different manners: with stone over a surface of 6,384,000 square metres; they are macadamized over an area of 1,484,500 square metres; asphalt covers about 315,470 square metres, and wood-paving covers about 568,300 square metres. The process of quarrying the stone, the yards, the necessary equipage, tools, materials, everything, are described in M. Strauss's book. One can, after having read it, easily understand the works which too often encumber our streets, and amongst which the wood-paving particularly excites the interest of the loafer — a fact which is most curious and amusing. Then come the sewers, the water-works, the gas and electricity, the central markets, etc. All these studies are preceded by little historical introductions, which are very interesting when it comes to the Bourse du Commerce, the Hôtel de Ville, the prisons and hospitals.

How great a progress has been accomplished! What a long road has been passed over in the administration of the public services! Take hospitals, for instance. These are no longer the times when four, five and six patients were required to sleep in the same bed, pell-mell and side by side, without any one ever thinking of isolating or separating them one from the other; when the poor convalescents, the sick and the mad were hived together, and when the most frightful mortality decimated the patients in the hospitals, particularly at the Hôtel Dieu. A description of this state of things is frightful to a degree, and it dates back hardly more than a century. To-day the hospitals are admirably kept, and very numerous. In taking stock of the most recent ameliorations, it is discovered that twelve thousand beds are to-day in daily use by the sick poor in the Paris hospitals It is not true that at all times the number of beds exactly fixes the population of the hospitals. Usually the hospitals contain more sick than the normal number of beds. Yet the supplementary beds used have the double disadvantage of increasing the expense of maintenance and of being injurious to the health of the patients, who are deprived of their necessary allowance of air, which should be forty or fifty cubic metres. Each of the establishments is administered by a director, generally assisted by a steward. The provisions are supplied by the Department d'Assistance Publique, which supplies meat, bread, wine, vegetables and medicine. The greater number of hospitals are provided with laundries, and so do their own washing. Those establishments which have no laundries are assisted by those neighboring hospitals which have them. Thus the number of laundries is but nineteen, several of which are badly installed, badly equipped, and cannot be enlarged, while the quantity of linen which must be washed constantly increases, and to-day exceeds twelve million kilogrammes per year; that is to say, thirty-five to forty thousand kilogrammes daily. The cost of this laundry-work is about ten francs per hundred kilogrammes, and the administration is now studying how to reorganize the work, either by establishing a central laundry at Salpêtrière, or by making alterations in the present laundries.

Another very important service in the hospitals is the kitchen, with its dependences,— the ice-room, pantry, butler's pantry, butchers' shop, vegetable-room, etc.; but this is not all. The invalids often complain of having to eat cold meals. The distance between the kitchen and the wards is often great, and the roast meat has thus time to become cold — and this is a very serious annoyance to invalids and old persons. So the new hospitals, like the Hôpital Tenon, are supplied with an underground railway and lifts for the transportation of provisions: one on the Decauville system has recently been introduced at the Salpêtrière. A fine laundry, well arranged, a vast kitchen well lighted and of immaculate cleanliness, are, as it were, cheerful notes to find at the side of the operating amphitheatres, the dead-house, and the dissecting-rooms. As a rule, the dead-house is relegated to the farther limit of a well-aired court, as far removed from the other buildings as conditions allow.

Hospitals are very numerous in Paris and its suburbs. The most celebrated is that of Bicêtre, whose lofty walls dominate Paris. The old Bicêtre partook more of the nature of a prison than a hospital. "It is impossible," wrote Michelet, "to know what the prisoners, invalids and paupers suffered at Bicêtre: compelled to sleep as many as seven in a bed, eaten by vermin, nourished on mouldy bread, housed in damp rooms, often in cellars, fearing, on the slightest pretext, the whip-lash, they looked enviously toward the galley as if it were paradise." While looking through the immense establishment at Bicêtre, quite rejuvenated and metamorphosed about fifty years ago, these old memories involuntarily come to mind. It is the custom to show visitors the cell occupied by Latude, that legendary prisoner of the ancient bastiles, who sojourned at Bicêtre from August 2, 1777, to March 23, 1784. It was at Bicêtre that the first experiments with a guillotine were made, at seven o'clock in the morning, April 17,1792, in the presence of Drs. Phillippe, Pinel, Cabanis, Louis, Cullerier and Guillotin, corpses being used for subjects. The prisoners hoisted themselves up to the gratings of their windows, and in this way were present at the sinister experiment. The old Bicêtre was at the same time a prison, an almshouse, an asylum for old people, a special hospital, a lunatic asylum, a political bastile, and an infirmary for infants. The present Bicêtre consists of only two grand administrative divisions, namely, a hospital for old people and an insane asylum. In reality it shelters three distinct groups — old people, mad people, and idiotic and epileptic children. The buildings of the hospital properly so called extend around four rectangular courts, planted with trees and ornamented with gardens, where the old people warm themselves in the sun upon benches arranged at intervals. In case it rains, they take shelter under the arcades. All occupants of the hospital who are strong enough are expected to work. The four hundred working-people at Bicêtre are scattered amongst clothing-shops, tapestry workrooms, locksmith shops, painting and glazing shops, and shops where coopering and plumbing are done. The articles manufactured in these workrooms are sold for the benefit of the establishment.

It can be seen by this brief epitome of the chapter on hospitals and asylums collated while skimming over the pages that Mr. Strauss' s book very well shows, as I have said, the organization of Paris, its administration and the working of its services. One finds in it, apropos of prisons and poor-houses, many details concerning the criminal world, of which most people are ignorant. These facts are not useless, and can only bring about an amelioration or greater degree of completeness in the construction of these public edifices, and it is that architects may surround themselves with all possible sources of illumination that I draw the attention of the readers of the *American Architect* to "*Paris Ignoré*," since they will find in it, at all events, studies that are very interesting from a philosophical and social point of view.

IN another column will be found a reproachful communication from Mr. George P. Merrill, who evidently feels that he deserves better of his generation than that generation has yet admitted — and, to save misconception, we will say at once that the generation is distinctly in the wrong. But admitting that Mr. Merrill is right in his conclusion, he is distinctly wrong in his premises.

In so far as his reproaches have justification, we freely admit that they should in larger part be levelled against ourselves than against the members of the profession at large, whom he charges with being lax of interest in acquiring knowledge of the materials they use and disregardful of their clients' interest. He intimates that no one of them, or very few at least, has ever carried out investigations into the structural qualities of building-materials, and, strangest charge of all, accuses them of not being buyers of books! We fancy Mr. Merrill can have little real acquaintance with architects, for our own knowledge of them leads us to believe that there are few men who spend a greater proportion of their income on purchasing books than do American architects. But this must be qualified by declaring that, inasmuch as this is a new country, and as therefore most architectural information relates to the Old World, the greater part of an architect's library of necessity relates to foreign architecture, foreign materials and foreign methods of construction.

The nub of Mr. Merrill's claim lies in the fact that he has written a book, an excellent book, an admirable one, which in spite of its merits has apparently fallen flat on the market and deceived the expectations of both author and publisher, and for this untoward result we believe that in a considerable degree we are responsible, responsible in this way: The publishers of the book duly sent us a copy for notice and review, but unfortunately it arrived but a short time before our office was invaded by fire and in the confusion and litter that was consequent on repairs the book was so far lost to sight that its character and very existence were forgotten, to such a degree even that some months later we took occasion to express regret that no one competent for the task had ever undertaken to make a thorough, reliable and comprehensive investigation as to the existence, characteristics and qualities of the building-stones, known and unknown, in all the several parts of this country — the very work Mr. Merrill had already accomplished.

The fact that Mr. Merrill is curator of geology in the National Museum at Washington, even if nothing else were known about him, would earn for his work the attention that is usually accorded to a scientist, even if he had not already achieved note as a man of practical ideas.

As we have said, this book, "*Stones for Building and Decoration*,"[1] is an excellent, an admirable book, but, best of all, it is a practical one, clear in statement, commonsensical in its arrangement, and usable for the needs of every-day life, and if what we say here shall bring about a greater immediate return from the author's copyright account it will give us great pleasure, as surely he deserves this much at the hands of the profession, in spite of the stigma he casts upon them through arguing from improper premises.

As for the book itself, it begins with a brief historical and geological chapter, in which the geological formations are concisely described, their composition given, and the general manner in which the several deposits are distributed in the several States. In further explanation of this a table is given which shows for the several States what deposits exist therein and which of them are now worked and which are as yet practically neglected by the purveyors of building-stone.

Distribution is the key-note of the method which the author has followed, and the Second Part is devoted to the consideration of the manner and degree in which the several classes of building-stone are distributed through the different States. Here, under the headings Steatite, Serpentine, Gypsum, Limestone, Granite, Schistose Fragmental Rocks, and so on, will be found a more full and complete consideration of their geological properties than was given in the First Part, followed, under each class, with one or more paragraphs showing where and how the particular stone is found in each State — alphabetically arranged — and in what way the deposit varies from or conforms to the generic peculiarities of the stone under consideration.

In this Part builders and architects will probably be surprised at finding enumerated a number of good building-stones common to their own place of nativity or domicile of which they have been in total ignorance — a discovery which may lead to the opening of new quarries and the building-up of new industries.

The Third Part is even more practical than the others, and it is the one which will probably be read with most thoroughness, since it describes with clearness and sufficient fulness the ordinary manner and method of quarrying building-stone. In this Part also are considered the important matter of the weathering of building-stone, their comparative durability, and some of the methods that have been or may be employed for their preservation when built in the wall.

A full table of contents and a complete and careful index would be enough to make the book a complete and adequate hand-book of the subject; but there is also given an Appendix, which contains a table which gives the weight, specific gravity, crushing-strength and ratio of absorption of some two hundred and fifty varieties of building-stone. Further value is added by a short glossary of terms, in which we detect not one of those extraordinary terms which are never used, nor yet met with in books, except in glossaries which seem to be compiled only to establish the scholarship of the compiler. To this is added, furthermore, a bibliography which we give below in full. All taken together, this book is one of too real a practical value to be neglected by architects, and we hope our words will be heeded to such a degree that the author may no longer have reason to believe that architects "do not buy books."

We might find some things to criticise, but it will be enough in the way of detraction if we point out that a greater number and better quality of illustrations might easily have been introduced, colored plates, for example, as in Burnham's book on Limestones and Marbles, and that the index would have been improved if it had contained the local and colloquial names of stones as well as the formal scientific ones.

"The following list includes all the principal works on the subject of building-stone which have come under the writer's notice. It does not include isolated and special papers which have appeared from time to time in various journals and periodicals, or State geological reports. Such, when containing matter of sufficient importance, have been mentioned in the text and reference given in the foot-notes. The list is arranged alphabetically by authors:

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Kunz, George F. Gems and Precious Stones of North America. Scientific Publishing Company. New York, 1890.

Malécot, Léon. Matériaux de Construction employés en Belgique. Bruxelles & Liége, 1866.

Newberry, J. S. Building and Ornamental Stones. Report of Judges, Group 1, U. S. International Exposition, 1876, Vol. III. Washington, 1880.

Notes on Building Construction. Part III. Materials. (South Kensington Educational Series.) London, Oxford and Cambridge, 1879.

Schlegel, Carl Friedrich. Die Lehre von den Baumaterialien und den Arbeiten der Maurer. Leipzig: Verlag von Heinrich Matthes, 1857.

Schmidt, Otto. Die Baumaterialien. Berlin, 1881. Verlag von Theodor Hofmann.

Smock, John C. Building-stone in the State of New York. Bulletin No. 3, New York State Museum of Natural History, March 1888, 8 vo. 152 pp.

Report on the Building-stones of the United States and Statistics of the Quarry Industry for 1880. Vol. X. Report of the Tenth Census of the United States. Washington: Government Printing-office, 1884.

Thurston, R. H. Materials of Construction. New York: Wiley & Sons, 1885.

Violet, Adolph. Les Marbres et les Machines à travailler le marbre. (Rapports sur l'Exposition de 1878, XXVIII.) Paris, 1879.

Visser, J. E. Die Baumaterialien. Handbuch für Architecten, etc. Emden, 1861.

Webber, Martin. Das Schleifen, Poliren, Färben und künstlerische Verzieren des Marmors. Weimar, 1878. Bernhard Friedrich Voigt.

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In connection with the foregoing bibliography we will give the following one[2] which Professor Chandler of the Massachusetts Institute of Technology has affixed to the little treatise on Limes, Cements, Mortars and Concretes, which he has prepared for the use of his class. Whether this little pamphlet of forty pages can be procured by outsiders, we do not know; but it contains a digest of some of the latest investigations of experiments, as well as of those of older and standard authorities, it brings nearly to date and in very compact form those conclusions which now form the basis of the best modern practice:

Vitruvius.
Pliny.
Higgins. Calcareous Cements.
C. W. Pasley. Limes and Cements. London, 1838–47.
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Vicat. Recherches sur la Chaux, 1819. Trans. by Capt. J. T. Smith, F. R. S., 1837.
Treussart. Mémoires sur les Chaux et Ciments. Trans. by J. G. Totten. New York, 1842.
Lipowitz. Manufacture of Portland Cement.

[1] "*Stones for Building and Decoration*," by George P. Merrill, Curator of Geology in the United States National Museum. New York: John Wiley & Sons, 1891.

[2] "*Notes on Limes, Cements, Mortars and Concretes*." Prepared for the Students in the Architectural Department of the Massachusetts Institute of Technology. By F. W. Chandler. Boston: Collins Press and Bindery, 1892.

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Reid and Lipowitz. On Concrete.
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Proceedings of the British Institution of Civil Engineers:
John Grant. Articles in Vols. XXV, XXXII and XLI.
Charles Colson. Experiments on the Portland Cement used in the Portsmouth Dockyard Extension. Vol. XLI.
Isaac J. Mann. The Testing of Portland Cement. Vol. XLVII.
Q. A. Gillmore. A Practical Treatise on Limes, Hydraulic Cements and Mortars. New York, 1874.
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H. Faija. Portland Cement for Users. London, 1884.
Transactions of the American Society of Civil Engineers:
W. V. Maclay. Notes and Experiments on the Use and Testing of Portland Cement. December, 1877.
Preliminary Report of the Committee on a Uniform System for Tests of Cements. January, 1884.
Report of the Committee on a Uniform System for Tests of Cements. November, 1885.
Eliot C. Clarke. Record of the Tests of Cements made for the Boston Main Drainage Works, 1878–84. April, 1885.
F. Collingwood. Behavior of Cement Mortars under Various Contingencies of Use. November, 1885.
Alfred Noble. The Effect of Freezing on Cement Mortar. March, 1887.
Hints on Cement Testing. September, 1891.
J. Sondericker. How to Test the Strength of Cements. Am. Soc. Mech. Engrs. for 1888.

ILLUSTRATIONS

[*Contributors are requested to send with their drawings full and adequate descriptions of the buildings, including a statement of cost.*]

THE LINCOLN MONUMENT, LINCOLN PARK, CHICAGO, ILL. MR. AUGUSTUS ST. GAUDENS, SCULPTOR. MR. STANFORD WHITE, ARCHITECT, NEW YORK, N. Y.

[Gelatine Print, issued with the International and Imperial Editions only.]

BIRD'S-EYE-VIEW OF COPLEY SQUARE, BOSTON, MASS.

IN connection with the announcement of a competition for the remodelling and decoration of Copley Square we publish this view, and will repeat that any person desiring to avail himself of such aid can procure a larger print of it on drawing-paper by forwarding twenty-five cents to the Secretary of the Boston Society of Architects, Mr. H. Langford Warren, 9 Park St., Boston.

LABORATORY BUILDING FOR MT. HOLYOKE COLLEGE, SOUTH HADLEY, MASS. MESSRS. EARLE & FISHER, ARCHITECTS, WORCESTER, MASS.

GYMNASIUM FOR THE UNIVERSITY OF VIRGINIA, CHARLOTTESVILLE, VA. MESSRS. CARPENTER & PEEBLES, ARCHITECTS, NORFOLK, VA.

LUNATIC ASYLUM, WEST ROXBURY, MASS. MR. EDMUND M. WHEELWRIGHT, CITY ARCHITECT, BOSTON, MASS.

HOUSE AT GUADELOUPE, MEXICO. DESIGNED BY MR. C. ALOIS HERMAN, ST. LOUIS, MO.

[Additional Illustrations in the International Edition.]

THE SARATOGA BATHING-ESTABLISHMENT, SARATOGA, N. Y. MESSRS. FULLER & WHEELER, ARCHITECTS, NEW YORK, N. Y.

THIS building, which is owned by Mr. H. M. Levengston, Jr., was erected recently, at a cost of about $80,000.

PLAN OF THE SAME.

52 CADOGAN SQUARE, LONDON, ENG. MESSRS. ERNEST GEORGE & PETO, ARCHITECTS.[1]

THE improvement of Lord Cadogan's estate has given opportunities to several architects to depart from the established type of West End house. Cadogan Square is one portion of the estate where a comparison between many designs can be made.

CHÂTEAU DE PIERREFONDS: CHAPEL AND GRAND PERRON.[1]

THIS illustration shows another part of the court, including the chapel, which is situated nearly at right angles to the part lately given.

[1] NOTE. — As we go to press we find it is still uncertain whether this plate will arrive in time to be included in this issue. In case of actual omission it will be furnished with the next issue. — EDS.

PREMIATED DESIGN FOR AN OXFORD UNIVERSITY-EXTENSION COLLEGE. MR. C. R. ASHBEE, M. A., ARCHITECT.[1]

THIS design was prepared as a pattern plan upon which, subject to the modifications suggested and the requirements needed by any flourishing university-extension centre, further and more specific plans might be based. The following data were assumed: That (1) an average flourishing centre would need accommodation for 200 students in one large hall, irrespective of the other class-rooms. That (2) the centre, even if flourishing, would be impecunious, and all architectonic effect would have to be got inexpensively. That (3) the centre might reasonably be situated in a well-to-do country-town; and that therefore (4) the land procurable would have to be economized, and would probably be of the nature of ordinary street frontage, with a depth of say fifty or sixty feet. That (5) all planning should admit of the possibility of later expansion. The building as shown could be provided for a sum of £2,000, subject to the possibilities of the district as regards building-material — stone, brick, etc., — and exclusive of the internal fittings, for which another £500 might be reckoned. It provides the following: a hall, a vestibule, a secretary's office, men's and ladies' cloak-room and lavatory accommodation, a small lecture-room, a students' library, a large lecture-room, a laboratory and care-taker's apartments. In the style chosen it was the endeavor to express three things: (1) strict utility, as, for instance, in the square forms of the windows and the large light of the lecture-hall, etc.; (2) the idea of continuity from the universities, the architectural treatment being such as to carry out the idea of expansion expressed in actual stone in the buildings of Oxford and Cambridge, even as the extension movement is the social and literary expansion of the universities over the country; and (3) in the style indicated, namely, that fusion between the late Gothic and the Renaissance, though liberally treated for modern purposes and though the most strictly utilitarian, a reference to that earlier and greater extension of the universities when Colet lectured at Oxford and Erasmus led the new learning of Europe from his little cell at Queen's. The design was exhibited in the last exhibition of the Royal Academy.

NOTES AND CLIPPINGS

THE COMINO-TREE OF COLOMBIA. — This tree, called "comino," produces an excellent wood for the use of cabinet-makers, and contains some exceptional properties, not only for high-class furniture but for building purposes. The common kind of comino is very much appreciated for house-building, its merit being that it is perfectly proof against all wood-destroying insects so prevalent in this part of Colombia. It is a well-known fact that all kinds of timber used for building purposes in this country are assailed and destroyed within a short space of time by insects called "comejen," a winged insect; and a house built of common timber is fought shy of by all purchasers of property, whereas property built of comino-timber will stand strong and unchanged for ages, and is unaffected by either insects, water, soil or climate. There is another kind of comino-wood having the same properties as above described, but commanding a very high price and used mostly for veneering purposes. It is of a beautiful dark and light undulating color of a yellowish tortoise-shell appearance, as will be seen by the small box I send with the seed. High-class furniture veneered with this kind of comino, called here "comino crespo," presents a magnificent appearance, always bringing a high price if well worked and properly finished. This tree is especially grown in the department of Antioquia, and also serves as a handsome ornament to a country place. You will likewise find inside the box of seed some leaves which I have picked from some plants in my country home. The comino above described can be successfully cultivated at a temperature of between 18° and 20° C. I have no doubt but that if it can be cultivated and acclimated in the United States this beautiful and wonderful tree will be a great and an important acquisition to the American wood-workers. One fully-developed tree of comino can yield four hundred pieces, as follows: Two hundred boards 9 feet long, 10 inches wide, by 1 inch thick, and each of them can be sold for $1.20; two hundred girders, 9 feet long, 4 inches wide, by 2 inches thick, and each is sold for $1. Besides, the branches of the tree are utilized for small columns for windows and for other purposes, and the very thin or exiguous ones for fuel, although it burns very badly, yielding a great deal of smoke. The comino-tree is not the *Sandalo citrino* of Ceylon, Brazil and China, as is believed by some. — *Luciano Santa Maria, U. S. Vice-Consul, Medellin.*

LIEUTENANT PEARY'S ARCTIC HOME. — The general theory of its construction was to make it a series of light tight shells, inclosing several air-spaces between the innermost and outermost coverings. The frames were made of six boards, 10 inches wide by 1 and 1-4 inches thick. They rested upon three plank sills, and were spaced three feet apart lengthwise of the house. Boards similar to the bottom board of the frames were placed upon the plank sills, half-way between each two frames, and these with the bottom boards of the frames formed the floor-joists, spaced 18 inches apart. Then the floor was laid of one and one-quarter-inch yellow-pine boards 3 inches wide, tongued and grooved, and solidly blind-nailed to every floor-joist. Next came the roof and sides. First, heavy two-ply tarred paper was laid in horizontal courses entirely around the house, against the outside of the studs, from the ground to the ridge, each course overlapping the one below, like weather-boarding, and nailed to each stud. Then over this was laid

the outside boarding, of one-inch boards, tongued and grooved. When this boarding was finished, all the horizontal laps of the tarred paper were tacked to it (from the inside, of course) to make wind-tight joints. Then three-ply paper was put on outside of the boarding, in vertical strips running from the ground up the wall, over the roof, and down the other side to the ground again. On the ends the strips ran from the ground to the edge of the roof. Each of these strips lapped the others about two inches, and the laths nailed continuously from ground to ground over these laps made wind and rain tight joints. This completed the outer shell of the little house. Then came the lining of the interior. First, thick sheets of pasteboard known as trunk-boards, 3 feet wide by 4 feet long, and a quarter of an inch thick, were nailed against the inside of the studs, on the sides, and overhead, until the entire house was cased-in Now, if you have followed me closely you will see that the house consisted of two shells, the outer composed of two thicknesses of tarred paper and an inch of closely-fitted boards, and the inner composed of thick trunk-boards. Between these two shells was an air-space varying in thickness from 10 inches at the sides to over 3 feet in the centre of the triangular place just under the ridge. Now, as air is known to be a good non-conductor, if the air in this space could be prisoned effectively it would form the most simple, cheap and effective blanket. So all the joints in the cardboard were carefully pasted over with wide strips of heavy brown paper and made perfectly air-tight. — *Harper's Young People.*

What a Pound of Coal can do. — "The day is not far off when we will get heat and power without the intervention and assistance of fire," said Civil Engineer Marston McGrath to a St. Louis *Globe-Democrat* reporter. "The solution will come when we get electricity direct from coal without the loss of any part of the wonderful energy that there is in the fuel. I never knew fully the value of coal as a power-producer until I saw it exemplified on a recent trip across the Atlantic in the steamer '*Majestic.*' The vessel carried 2,400 tons of coal, — almost enough to give a half-bushel to every family in St. Louis, — and it used up 290 tons a day to maintain a speed of about twenty-three miles an hour. This seems like an awful lot of coal, doesn't it? But the '*Majestic*' is a big boat, 582 feet long, and it requires an expenditure of 18,000 horse-power to drive it at top speed through the water. Figure the thing out, though, and you will see that 1 and 1-2 pounds of coal, which is less than a good handful, furnishes one horse-power for one hour, and one horse-power represents the lifting to a height of one foot of 300 pounds, so that your 1 and 1-2 pounds of coal lifts 300 pounds one foot, and sustains it for one hour. Or take this illustration: It would require 100,000 galley-slaves rowing night and day to carry the '*Majestic*' at a speed of twenty-three miles an hour. Dividing 18,000 horse-power into 100,000 galley-slaves, we find that over 1 and 1-2 pounds of coal represents the work for one hour of about six rowers. Of course there wouldn't be room for the placing of more than 400 oars on the '*Majestic,*' and ten bushels of coal would do an equal amount of work, while the 100,000 galley-slaves, if they averaged 150 pounds each, would weigh five times as much as the 1,740 tons of coal required by the '*Majestic*' for a six-days' trip."

A Garbage-Crematory Test. — The garbage crematory erected in the city offal-yard at the foot of East Brookline Street, on Albany Street, by the Brown Developing Company, was tested to-day in the presence of members of the City Government, and the results were apparently quite satisfactory. The crematory is about twenty-three feet long, ten feet wide, and ten feet high, and has fire-brick walls a foot thick, covered with boiler steel, braced with great iron rods to keep them from being forced apart by the heat. The receptacle for the garbage has a capacity of several tons, and is fed through openings in the top with iron covers. The furnace in which the fire is started is a part of the structure, and is fed with crude petroleum conducted by means of pipes from a large tank a considerable distance away. A wood fire is first started and then the oil is turned on, and, with other devices for generating inflammable gases, an intense heat is soon produced. A blower, run by a six-power steam-engine, forces this fiery mass into the receptacle for the garbage, which is slowly fed-in until it becomes a burning mass. After that the combustion is very rapid, the garbage disappearing almost as rapidly as it can be shovelled in. There are two chambers for its reception and there is a system of draughts by which all the smoke and gases go from one to the other, making a complete circuit of the crematory, and then what is left escaping to the air through a high chimney. In the test to-day all kinds of stuff were fed into the furnace just as they came from the places where they were collected, tin cans, bottles, bones, and similar matter being disposed of. From twenty-five to thirty gallons of oil, costing about three cents a gallon, were used each hour, consuming from four to five tons of offal an hour. Scarcely any ashes are made. The amount of garbage collected by the city each day is two hundred tons, and it is estimated that this can all be consumed by four furnaces at a cost of about twenty-five cents a ton The whole operation is remarkably free from odor, and scarcely an offensive smell is noticeable as coming from the furnace. — *Boston Transcript, February* 10.

A Pacific-coast Bathing-establishment. — A bath-house that Mr. Adolph Sutro is having built on the harbor shore near San Francisco gives promise of being one of the wonders of the Pacific Coast, so vast is the scale of construction. It is situated in a natural cove into which sweeps the line of surf. To break its onset and protect the building a massive sea-wall has been built. On the inner side of it is an enclosure with a capacity of 1,000,000 gallons of water, and adjacent to this are six apartments, or bathing-tanks, which are to be filled from the large reservoir with water at various temperatures, to suit the bathers. No pumping will be necessary, the flow from the ocean being continuous by reason of the conformation of the cove, which is that of a horse-shoe. In the calmest weather all the tanks can be filled in fifty minutes. The waste water is carried by pipes far out to sea. Back of the baths tiers of seats are to be raised for the accommodation of thousands of spectators. The dressing-rooms, four hundred in number, will be placed under the seats and on five different floors. They are to be finished handsomely with natural woods and provided with the best appointments. On each floor there will also be a club-room. Elevators will carry patrons from story to story. Over all there will be a roof of glass 350 by 250 feet. At night the building will be lighted by electricity. A stage for dramatic performances and a promenade on the roof for use in summer are also features of the scheme. The work of construction will take a year and a half, from which alone the magnitude of the enterprise may be inferred.

The Quais at Marseilles. — The quays which have been constructed since 1857 are built on the following plan: A bed of stones is laid as a foundation, and on this a series of huge artificial blocks is placed, without any mortar between them. This series is continued up to the water-level; but, before the wall that is to form the front of the quay is built upon it, the system of blocks is subjected to great pressure, by means of two rows of similar blocks which are placed upon it, in order to make the subsoil and foundations settle quickly into the shape they will definitively assume. The two rows of blocks are then removed, and the wall is built in the usual way. This method of construction has given the most excellent results, and the quays so formed are second to none either in appearance or in durability. — *From Report of C. B. Trail, U. S. Consul.*

TRADE SURVEYS

That which is surprising and disappointing to most of the large business interests of the country — financial, railroad, manufacturing and commercial — is that the general liquidation of values that has been effected, on one hand, and the equalization between production and demand, on the other, have not been attended with the usual beneficial and stimulating results. The prescribed hygienic treatment has been, so to speak, gone through with, all the healthful requirements have been subserved, and yet there is not that degree of energy nor that degree of commercial and industrial activity that was anticipated. Yet when we look at the fact that the gross returns on 131,000 miles of railroad last year was 7 1-2 per cent greater than for 1891, and that the net earnings were a little over 2 1-4 per cent greater, it would seem, so far as railroads were concerned, that the complaints were without good grounds. It is true also that bank-clearings are larger, in short, that more business was done last year, but, owing to greater producing-capacity and more intense competition, prices for the greater part of the year were somewhat lower than for the previous year. But the chief source of dissatisfaction, we are told, lies in the fact above mentioned, that, after having suffered from previous misdeeds or neglect in economical matters, we are not recuperating in the direction of a heavier volume of business and better prices. The stock-markets are disappointing. Reading depreciated some thirty-four million dollars on paper. Some other systems suffered. Foreign investors "want to know" several things. There is an abundance of new stocks for testing purposes, but they are not wanted; in fact, the Stock-Exchange people wish they were rid of a good many calls they have to make. The trouble is, too many people are looking backward rather than forward, or trying to spy out new possible markets for merchandise and manufactures. The grinding-down agencies are still at work, though there is but little fluctuation in values or prices. Small lots of American securities are wanted abroad, and if foreigners understood the situation here better there would be a greater demand. There are, just at present, several unobserved agencies at work having our interests as a people in their keeping. One is the growing dependence of the outside world on this country for cereals and meats; another is the unobserved formation of new opinions and conclusions among the masses of the people on two or three vital questions of public policy. A more immediate cause at work is the changing policy of wheat, corn and cotton producers. Throughout the civilized world a new influence of this nature is at work, viz, to depend less on remote communities and create more of what is needed within each community. This is a natural reaction against the extremes which all peoples have been running into with the object of accumulating wealth through exchange of commodities. Production will increase, international exchange will also increase, but the percentage of purchases per head of population from foreign countries and from remote localities of each country must of necessity diminish. In other words, the Home-rule idea will soon begin to extend itself to industrial conditions. The apparent overproduction of cotton and wheat points in this direction. Farmers are losing money on seventy to eighty cent wheat, and cotton-planters see the risk they ran this season on cotton. In short, recent developments have given an impetus to that decentralization of industries which set in in 1861 in this country. As that condition is reached other conditions will improve permanently. To upset one financial theory with another as a remedy for this is not quite the right way. To make a low tariff succeed a high tariff is hardly the proper method either, as these are secondary causes, and do not strike at the root. Still, the game of politics must have material to play with. In current affairs there is nothing new to note. Two or three unimportant failures in the iron trade gave rise to rumors of more to come, but these failures were due to the fear of two or three five-cent country bankers. In quite a number of industries production is on at full pressure. The year of 1893 will, in all probability, be a year of low prices, because of the fact that three to six months' requirements in so many channels of trade are now being covered. For coal, stocks are everywhere moderate, and mines are producing nearly to maximum. In the world of machinery there is great activity; orders are multiplying, and raw material therefor is being promptly purchased. In building, the latest news is that builders are generally making preparations for a more active year than 1892. Jobbers are meeting with no obstacles in the distribution of goods, and the rank and file of traders are acting cautiously. The farmers are anxious to sell one hundred million bushels of wheat, and, so far as can be seen, they will find opening markets for their accumulations in due time. In manufacturing circles generally a nervous feeling exists over the possible harm that may come from the practically complete transfer of the administration from one party to the other, and it is quite frequently said in offices and counting-rooms that a conservative Presidential inaugural to-day may produce a marked improvement in trade.

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CONTENTS

SUMMARY: —

The delayed International Prints. — Mr. Hunt and the Royal Gold Medal, R. I. B. A. — The Agency of the Architect dependent on the Terms of the Contract with his Client. — The *Engineering Record* on the Competition for the City-hall at Davenport, Io. — The Chair of the Decorative Arts at the Ecole des Beaux-Arts. — The Nicaragua Canal and the Attempts to revive the Panama Scheme. 142
ARCHITECTURE OF THE LOW COUNTRIES. — I. 147
OFFICE-HELP FOR ARCHITECTS. — VIII. 149
CHINESE CURIOS. — II. 152
THE PROBLEM OF HEATING HOUSES. 154
CREMATING GARBAGE. 155
THE NEW-GRAFTON GALLERY, LONDON. 157
BOOKS AND PAPERS. 158
SOCIETIES. 158
ILLUSTRATIONS: —

House of George S. Willets, Esq., Corner Erie and Pine Streets, Chicago, Ill. — House at Brookline, Mass. — House at Overbrook, Pa. — The Old Colony Building, Chicago, Ill. — House at St. Louis, Mo.

Additional: House of E. J. Martyn, Esq., Astor St., Chicago, Ill — Villa at Champrosay, France. — Lateral Façade of the Same. — Anglo-Californian Bank, Austin Friars, London, Eng. — Hampstead Synagogue, West Hampstead, Eng. — Château de Martinsbourg, Mayence, Germany. 159
NOTES AND CLIPPINGS. 159
TRADE SURVEYS. 160

SUBSCRIBERS to the International Edition who now and then discover that some of the plates of that particular edition have not been received by them, although declared by the text to be properly a part of that issue, will spare themselves a little annoyance and wasted impatience if they will recall that Atlantic storms are things we cannot control, that, although stormy weather may delay the arrival of our invoices, it is very rare that an ocean steamer is actually lost, and that, consequently, they will receive, eventually, the delayed prints. The text-forms have to go to press on the assumption that the expected invoice will be delivered with routine regularity, though the connection — often a very close one — sometimes fails altogether, as it did last week and possibly may this week also.

THE Council of the Royal Institute of British Architects has nominated, as the recipient for the present year, of the Royal Gold Medal annually presented to some architect of the highest distinction, Mr. Richard M. Hunt of New York. Mr. Hunt is the first American ever selected for this honor, and there can be but one opinion in the profession throughout the United States, — that a better choice could not have been made. In this country, Mr. Hunt has for many years been unanimously regarded as standing at the very head of the profession of architecture. A quarter of a century ago Mr. Hunt's ideas and sayings were the talk of the offices, much as Mr. Richardson's became a decade later, and, although Mr. Hunt, during the most brilliant part of Richardson's too brief career, was rather out of the course of active practice, his splendid achievements since that time have shown how great and solid was the talent which had already won for him, in the country where he had received his early training, and had first shown his capacity, the highest honor which even France can bestow upon an artist. It is pleasant to find the great English professional body, which, in such matters, never acts without ample knowledge and long deliberation, selecting for its great honor one who has so long held the highest place in our regard; and American architects will feel the selection as, in a way, a compliment to all of them.

WE had a letter not long ago asking whether an architect had a right to accept proposals on behalf of his client, and, if he did so, whether his client could repudiate his action; and in such case what would be the position of the architect. As in all such cases, the answer to this question depends upon the contract between the architect and his client. It often happens that the latter requests the architect to act for him in such matters, or gives him specific authority to accept bids at his discretion for particular portions of the work. An authorization of this kind may be either written or verbal, and in either case, if it is distinctly expressed, it will entitle the architect to bind his client by acts done in accordance with the authority thus delegated. Unless such authority is expressly given, however, the architect cannot bind his employer by acts of the kind in question. In the ordinary contract of employment between the architect and his client no such authority is implied, and an architect who assumes such authority does so at great risk. If his client chooses to ratify the architect's action, he adopts it as his own, and he is then bound; but he is under no obligation to ratify it, and if he chooses not to do so the architect may find himself liable in damages to persons who have suffered loss through his unwarranted assumption of a right to which he was not entitled. It is true that such unauthorized acts are usually done by architects with the best possible intentions. They receive what seems to them a very favorable bid for a piece of work, and, fearing that their client may lose the advantage of it if the answer is delayed until he can be consulted, they accept it immediately, and, naturally, they think it rather hard if their client subsequently repudiates their good offices, and leaves them with an indignant contractor to console. For all that, their position is wrong. Even though their error may have been committed through excess of zeal, it is none the less an error, and, although clients are generally amiable enough to endure a little annoyance, or even loss, rather than disown the action of an architect whose only fault has been that he has been too anxious to serve them, such amiability is purely voluntary on their part. As in most questions concerning the relations between architects and their clients, the architect can form a pretty good idea of what his duties and rights are by putting himself, in imagination, in the place of his client. Whatever may be his estimate of the superiority of the architect's judgment to that of his client, he must acknowledge that, if he were the client, he would not like to be informed that he had been committed, without his knowledge or consent, to a contract. It is quite possible that the contractor to whom the architect had bound him might be personally objectionable; or there might have been, unknown to the architect, a lower bidder, or an offer from some one whom the client desired to favor; or the latter might, on ascertaining the amount of the bids, wish to drop the matter altogether, or modify his plans; and to find his discretion in regard to all these matters taken away from him by the hasty action of a man whom he had never authorized to act for him would be annoying, to say the least. It may be observed that old and experienced architects do not often fall into such errors. It is commonly the young and enthusiastic members of the profession who undertake to manage their clients' business for them, and it will be well for them to bear in mind that an architect's authority to act for his client is, where not expressly defined by agreement between them, or by the agreement between the client and contractor, held by the courts to be extremely limited. He may reject bad work and materials, and express his opinion as to whether a contract, or a portion of it, has been performed, and, in emergencies of construction, it is generally held that, as the scientific adviser, he may order the necessary steps taken, at his client's expense, to save the latter's property, but beyond this his implied powers do not go, and if he or his client wish that more authority should be vested in him a special arrangement must be made.

THE *Engineering Record* makes some very just and rather novel comments on the ridiculous "invitation to architects," recently issued by the committee having in charge the erection of a new city-hall for the town of Davenport, Iowa. As many of our readers have probably already seen and laughed over this precious document, we need only say that it provides that "the architects will be left to show as large and convenient a building as they can furnish and needed at a cost not to exceed seventy thousand dollars." The language of this sentence leaves something to be desired, but its meaning will be clear enough, particularly in the light of the succeeding one, which says that "the architect whose plans are accepted will be required to guarantee by certified

check to the amount of four thousand dollars that when advertised for bids there will be an offer from competent contractors within sixty days thereafter." Quarter-scale drawings are required, together with specifications, "complete enough for the committee to understand and consider the scheme for the proposed building without additional verbal explanation"; and, as an incitement to extraordinary effort on the part of architects, a prize of two hundred dollars is offered for the best set of plans and specifications, one hundred and fifty dollars for the second, and one hundred dollars for the third; no promise whatever being made that the author of the best design will be employed to carry it out, or will receive anything more than his two hundred dollars.

THE *Engineering Record* truly says that, "If anything could be more grotesquely repellent to solicited professional services of architects and engineers, we venture to say that it has not yet appeared in print," and it expresses astonishment that corporation officials should "so far abuse public trust in them as to effectually drive away the very professional men they are put in office to solicit, and thus completely defeat the purposes of their appointment." This comment is well put, and deserves the attention of all persons interested in municipal works. We are inclined to think that the Davenport committee acted innocently enough. Judging from the internal evidence of their programme, not one of them ever had anything to do with an architect, or had more than the vaguest notions in regard to the profession. The invitation, from beginning to end, is really addressed to builders, not to architects. There will be plenty of builders who will be glad of the chance to offer competing sketches of what they can undertake to do for the committee's seventy thousand dollars, and, of course, they stand ready to make a contract in conformity with their scheme. The four thousand dollars caution-money, in the case of competing builders, is a sufficiently reasonable security against deception, and the committee is, practically, not inviting designs in the way that architects understand them, but is calling for tenders, accompanied with samples, for city-halls, just as it would invite by advertisement bids for pork to feed the inmates of the almhouse, with, probably, the honest intention of giving the job to the man who will give the best article for the money, the idea of the intervention of an architect, as the man of science who will show the builder how to make the structure strong, convenient and beautiful, in ways which neither the committee nor the builder would ever think of without such help, never entering their heads. Of course, city-halls can be built in either way. Most of the civilized world concluded long ago that the service of the highly-trained professional man is essential for securing a proper degree of beauty and utility in a public building, but there are portions, particularly in this country, to which carpenters' city-halls seem good enough, and, so long as they are contented, we do not know that the outside world need feel called upon to interfere. Meanwhile it may be remarked that to write an invitation to builders, and call it one to architects, does not change the character of the persons to whom it is really addressed, and who will reply to it, but may, and often does, mislead people not immediately concerned, who, not being familiar with such matters, do not see that architects are about as likely to respond to such an invitation as the professors in a medical school would be to answer an advertisement for "surgeons" to officiate in an abattoir.

IT is a matter of considerable interest that the professorship of decorative composition in the École des Beaux-Arts, left vacant by the death of the celebrated decorative painter, Galland, has been conferred upon an architect, M. Henri Mayeux. The principal competitor of M. Mayeux for the appointment was a painter of considerable distinction, M. Luc-Olivier Merson, but the architect was preferred. M. Mayeux, although a thorough architect, has, ever since his student-days, been noted for his skill in composition and detail. In the early volumes of "*Croquis*," his brilliant designs were always among the principal attractions, and, although he has since become distinguished as a skilful and accomplished architect, his fame as a designer and composer of ornament has not grown dim. In this country, a man of such tastes would have been very likely to drop out of the ranks of the profession to devote himself wholly to painting or sculpture, but in France an architect not only may be, but is expected to be, an artist, and it does not seem strange there, as it would here, to find one exercising the functions of a professor of decoration in connection with an extensive architectural practice. Perhaps, however, it is even now less strange here than it would be in England, and it is a hopeful sign that it is so. In England, an architect who has any tastes outside his strictly professional work is usually an archæologist. Fortunately for us, we have nothing to archæologize about, and the necessity that our architects are under of recurring for inspiration to the allied arts and to nature, instead of the buildings of their predecessors, has been a good thing for American architecture, and will be of still greater value as it becomes more generally accepted.

THE wretched collapse of the Panama Canal scheme seems to have called renewed attention to the Nicaragua Canal, and the promoters of the latter enterprise have lost no time in taking advantage of the renewed public interest to call attention to the merits of their own plan. As we have often before described this plan we need not refer to it again. The point now particularly urged upon the public and on Congress is that of guaranty and control by the United States Government. As presented by the Canal Company, the risk assumed by the United States in lending its credit to the undertaking does not seem very serious, and the advantages of control by our Government are obvious. The concession from the States of Nicaragua and Costa Rica must, by its terms, be held by a private corporation, so that the Canal and the bordering territory could not become the absolute property of the United States, but the concession permits any foreign Government to own a majority of the stock in the Canal corporation, so that our Government can have practically complete control of the canal without entering into political complications with small, but friendly, States, and such control it is very desirable for the United States to possess. To say nothing of the danger that some European Government, such, for example, as that of Germany, which is very much alive to commercial advantages, might quietly buy a controlling interest in the corporation, and use it to our great and permanent detriment, it is evident that what is sure to be the great highway between our Atlantic and Pacific coasts ought to be under our own direction. If England has found it necessary, not only to buy a controlling interest in the Suez Canal corporation, but to seize and hold Egypt to make sure that its route to India is not interfered with, it is even more necessary for us to see that the naval and commercial connection between the two halves of our own country is secured against all possibility of interruption.

M. PH. DELAHAYE, in his regular article in the *Revue Industrielle*, of January 21, takes up the matter of the Nicaragua Canal, and the scheme for reviving the Panama Canal Company. We do not know whether he is related to the Deputy Delahaye who has taken such an active and creditable part in the legislative investigation of the Company's proceedings, but he seems to understand the subject thoroughly, and his article, though not long, is well worth reading. As to the amount of work actually accomplished with the monstrous sums sent to the Isthmus, and spent, his opinion appears to agree pretty closely with that of the American engineers, to which we referred in a recent article; but he does not enter into detail on this part of the subject, merely giving the exact figures, as disclosed by the investigation, of the amounts of stock and bonds issued, and money paid in. From these figures, however, he concludes that the attempt to float the enterprise again would be hopeless. No banking-house, he says, would undertake to offer to the public an investment so notorious, and it would be madness for the Government to guarantee it, as certain speculators are trying to induce it to do, on the ground that the passage of the law authorizing the lottery loan rendered the Government responsible for the proper application of the money. Before the Panama corpse can be galvanized into life, as M. Delahaye says, the people who had the spending of the Panama Company's money must say where and how they wasted the millions of French savings, and, as they are never likely to do this, he sees nothing in the way of carrying out the Nicaragua scheme. He sees no objection to having the canal under the direction, and virtual ownership, of the United States Government, and, with economy and honesty, assisted by the Government credit, he thinks the enterprise could certainly be carried out.

ARCHITECTURE OF THE LOW COUNTRIES.[1] — I.

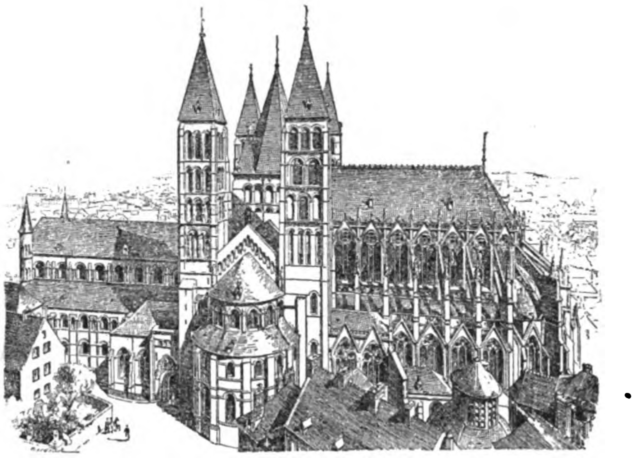

Fig. 1. View of the Cathedral of Tournai.

ACCORDING to Julius Cæsar, the Celts were the earliest inhabitants of the territory of the Low Countries. Their architectural achievements were confined to the erection of enormous unhewn stones, such as the Pierre Brunehaut, still standing in the vicinity of Tournai; their dwellings were nothing but wretched huts made out of the most common and the least-durable materials.

The Germans, who drove out the Celts a century and a half before the Christian era, have left no traces of their passage except a few *tumuli*.

After the conquest of the Belgian territory, which was undertaken by Julius Cæsar in the year 58 B. C., Roman civilization and arts were gradually introduced. Roman supremacy lasted nearly four centuries, or until about the middle of the fifth century. It was not until the reign of Augustus that this part of the Gauls was furrowed with roads and that posting-houses were established there for the accommodation of travellers.

The oldest cities of Belgium, Tongres and Tournai grew up at this time, on favorable sites at the intersection of military roads. The introduction of architecture, considered as an art, dates from this period; but it is hardly probable that in this remote section of the Gauls it attained a very high degree of perfection. Roman art was, moreover, in decadence and the Romanesque period was about to open. This first type of mediæval architecture dates, in fact, from the seventh century; it underwent a gradual transformation and development until the thirteenth.

ROMANESQUE PERIOD.

The Romanesque style, properly so called, was the only style in force in France, in the regions along the Rhine and in the territory of the Low Countries, during the period extending from the downfall of Roman supremacy there to the reign of Charlemagne. During this time the basilican disposition predominated, and constructions were generally very soberly decorated; it is clear that, though, on the one hand, the Romanesque artists of the Meuse district drew their inspiration from the Germanic traditions of the Rhine, those in other parts of this territory adopted the architectural principles of Northern France.

Of the edifices of the Germanic type, unquestionably the most important is the beautiful basilica of St. Servatius at Maestricht. The aisles and crypt date from the eleventh century; the rest of this remarkable monument belongs to the twelfth. Two towers, very simple in character, accompany the apse in which the choir terminates. The spacious narthex in front is the latest and richest portion of the church; its two quadrangular towers originally soared to a much greater height. One of the transepts is still adorned by a magnificent porch in a transitional style. The Romanesque cloister was replaced by a fine Pointed one in the fifteenth century. To the same Rhenish type we must also refer the Church of Notre-Dame at Maestricht, formerly a collegiate church.

At Nymegen, we likewise find Romanesque fragments of this type; the Minster of Roermond exhibits the same details; several examples still exist in the Province of Limburg, as the church of Alden-Eycken and the small church of Sluze. The Romanesque style appears, at Liège, in a notable part of the interesting Church of Sainte-Croix, in the churches of Saint-Barthélemy, Saint-Jean and Saint-Jacques. The little Church of Saint-Nicolas-en-Glain, in the vicinity of Liège, consecrated July 22, 1151, belongs to the same style, as well as several small basilicas in the Condroz, that picturesque portion of the Province of Liège.

There are Romanesque remains at Dinant and at Hastière; but it is to be remarked that, aside from the beautiful collegiate church of Maestricht, only fragments of structures have been preserved — here an apse, there a tower, or a façade, incorporated into edifices reconstructed at a later period, either in the Pointed or a much more recent style. To cite further, among the important churches, is the old collegiate church of St. Vincent, at Soignies, erected about 965. The transepts and choir terminate in straight walls. There are two imposing towers, one at the intersection of the transepts and nave, the other in front.

When the terrors inspired by the approach of the year 1000 had subsided, Hainault witnessed the erection of the most imposing edifice preserved in the Netherlands, namely, the Cathedral of Tournai, a vast basilica disposed in the form of a Latin cross (Fig. 1). The arms formed by the transepts, as well as the choir before its reconstruction in the Pointed style, terminated in apses. Nothing could be grander than the appearance of this vast structure, divided into three aisles, which make an angle with the transepts by two bays, and which are formed by two superimposed rows of forty pillars joined by semicircular arches. The magnificent apses constitute the most remarkable part of the edifice. Nowhere on the Continent is there, in our opinion, another sight as imposing. The lofty nave was originally covered with a flat ceiling; it was not vaulted until the eighteenth century. Above the cross rises the principal tower, square in form, with four more slender quadrangular towers at the angles of the transept.

We may add that the beautiful cloisters of Tongres and Nivelles belong also to the Romanesque era, but with these the list of the principal religious edifices in this style must be considered as completed.

As to civil constructions, it will be remembered that the institution of communes, which goes back to the eleventh century in the Netherlands, and to which the cities are indebted for their most beautiful civil monuments in the Pointed style, had not acquired sufficient preponderance before the middle of the thirteenth century to exercise any considerable influence on civil architecture. Therefore, hardly any important edifice of the kind is found that antedates the twelfth century. Houses of this period still exist at Tournai; the Halle aux Blés at Ghent has the architectural dispositions of these old dwellings. Let us note in passing that its gable is broken in steps, as in the houses of the sixteenth and seventeenth centuries, which shows how incorrect is the term "*Spanish gable*," which is generally applied to this form.

THE TRANSITIONAL PERIOD.

The architecture of the transitional period has left few traces in the Netherlands, except in houses of worship, and even in these the simultaneous use of the semicircular and pointed arch is but seldom the only constructional method adopted for the *ensemble*. In the cathedral of Brussels (Sainte-Michel-et-Gudule) and in the Chapelle of the same city, as also in the collegiate church of St. Martin, at Ypres, the choirs offer fine examples of the transitional style. More complete specimens are found in the churches of Saint-Quentin, Saint-Piat and Saint-Brice at Tournai; in the Chapelle du Saint-Sang at Bruges, in the church of Notre-Dame-de-Pamele at Oudenaarde and in the church of Lisseweghe. In Saint-Sauveur at Bruges, Saint-Jacques at Ghent and Saint-Pierre at Ypres, it is mainly in the towers that traces of it are to be seen, but the splendors of the style are especially displayed in the decoration of the beautiful portal of the collegiate church of St. Servatius, at Maestricht.

The Pointed period, the major part of whose monuments, religious as well as civil, belong to the tertiary style, was extremely prolific in edifices of all sorts in the Low Countries. Yet, however remarkable the civil constructions may have been, it was particularly on religious edifices that the architects of the time lavished all the wealth of their brilliant art. The transformations characterizing the three divisions of the Ogival period correspond, as in France, almost exactly to

[1] From the French of J. van Ysendyck, in Planat's *Encyclopédie de l'Architecture et de la Construction*.

the thirteenth, fourteenth and fifteenth centuries; and in the Low Countries it even extends to the middle of the sixteenth century.

In consequence of the augmentation of the *personnel* of the chapters, the increased power and importance of the abbeys and the additional pomp introduced into religious ceremonies, the churches took on more importance; their plans were enlarged, and in most cases the choirs were at first surrounded by collaterals, which were themselves usually accompanied by chapels; in the fourteenth century the side-aisles even were bordered with chapels; in the fifteenth and sixteenth this disposition became general. Notwithstanding the spaciousness of the cathedrals and abbey-churches, their façades are not adorned with triple porches with deep covings, like those of the cathedrals of Paris, Amiens and Chartres; the beautiful rose-windows of these last monuments exist in the others only in the southern transepts of the collegiate church of St. Martin, at Ypres, and of the church of Notre-Dame-au-Sablon at Brussels. The use of flying-buttresses becomes equally rare at the end of the fifteenth century. They are replaced by the buttress alone, even to support the loftiest naves covered with vaults of wide span, as in the cathedral of Saint-Bavon and the church of Saint-Michel at Ghent, in the church of Saint-Jacques at Liège, as well as in the great chapels of the cathedral of Brussels. Iron tie-rods are generally introduced at the springing of the vaults.

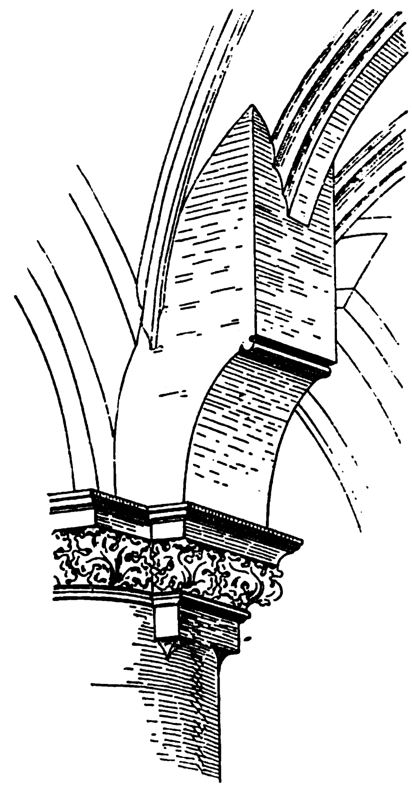

Fig. 2. Corbelling in the Church of St. Waltrudis, at Herenthals.

We may properly insert here (Fig. 2) an illustration of an original disposition peculiar to the construction of the buttresses in the church of St. Waltrudis at Herenthals. Instead of placing the upper buttresses on the *doubleaux* separating the seven vaulting compartments in each of the side-aisles, the architect of this interesting edifice carried them back, by means of corbelling, to the capitals of the columns between the two naves. The disposition of the cloister partially enclosed in the angle formed by the transept and the northern side-aisle in the collegiate church of St. Martin, at Ypres, also furnished occasion for the contrivance of especial flying-buttresses. Those supporting the vaults of the lofty nave are themselves supported by flying-buttresses neutralizing the thrust of the vaults above the north side-aisle, and in this way the buttress of the latter is far enough away from it to give all the space requisite for the face of the cloister attached to the northern nave.

Aside from the church of Saint-Lambert at Liège, which had originally three towers, religious edifices of the thirteenth century generally possessed but one tower. The spires crowning them were of wood. Of the fourteenth century, hardly any can be cited except the two adorning the primary church of Huy and the beautiful constructions forming the façade of the cathedral of Brussels (Fig. 3). On the other hand, in the fifteenth and sixteenth centuries, a large number were erected; the most remarkable of these belonged to the churches dedicated to St. Martin [? Notre Dame], at Hal, Ypres and Courtrai, to Notre-Dame-du-Lac at Tirlemont, Saint-Bavon at Ghent and Sainte-Walburga at Oudenaarde; the tower of the church of Sainte-Gertrude at Louvain and its openwork stone spire; the tower of St. Catherine's at Dieghem, with its original termination, and lastly the splendid towers of Notre-Dame at Antwerp, only one of which is wholly completed (see "Religious Architecture," Fig. 28, *American Architect* for August 16, 1890). In Holland were constructed the towers of the great churches of Utrecht and Breda and those of the beautiful cathedral of Saint-Jean at Bois-le-Duc. To this period belong also those colossal trunks of towers constructed on the fronts of the churches of St. Waltrudis at Mons, Saint-Sulpice at Diest, St. Rombold at Mechlin, Saint-Jacques at Antwerp, Saint-Michel at Ghent, the cathedrals of Zierikzee and Leeuwarden and St. Peter's at Louvain, — towers which, by their elevation, their beauty and the boldness of their spires, would have been, like the tower of the cathedral of Antwerp, among those marvels of Pointed art whose conception and originality are confined exclusively to mediæval artists.

Among the numerous religious monuments erected in the thirteenth century, we must assign to the first rank the Church of Saint-Paul, at Liège, the primary church of Notre-Dame at Tongres, the naves and transepts of the collegiate church of St. Martin, at Ypres, the choir of the cathedral of Tournai (Fig. 1), the church of St. Leonhard, at Léau, and the primary church of Dinant. It was during the fourteenth century that the following were constructed: the cathedral of Saint-Jean, at Bois-le-Duc, the primary church of Huy, that of Aerschot, the beautiful church of St. Martin [? Notre Dame], at Hal and the naves and choir of the church of Sainte-Croix, at Liège. To the fifteenth and sixteenth centuries belong the church of Verwick, the primary church of Saint-Sulpice, at Diest, Sainte-Walburga, at Oudenaarde, the cathedral at Antwerp (see "Religious Architecture," Figs. 27, 28, *American Architect*, for August 16, 1890), the church of St. Gommarius, at Lierre, St. Rombold, at Mechlin, St. Peter's, at Louvain, Saint-Michel and Saint-Bavon, at Ghent, St. Waltrudis, at Mons, Saint-Jacques and St. Martin, at Liège, the church of Hoogstraeten, and Notre-Dame-au-Sablon, at Brussels. Freestone in small blocks, obtained from numerous quarries opened in Belgium during the Middle Ages, was employed in the construction of all these edifices. In Holland and along the entire *littoral*, where there was no stone and where the means of communication were very inadequate, brick was used from the thirteenth century; this was the material employed in the churches of Utrecht, Dordrecht, Haarlem and Breda. In Belgium the cathedral of Saint-Sauveur, at Bruges, was erected, and also the church of Notre-Dame in the same city, with its important tower and slender spire. Throughout this region brick was the common building-material. It was carved and ornamented with mouldings, and even the mullions and the clerestories of the

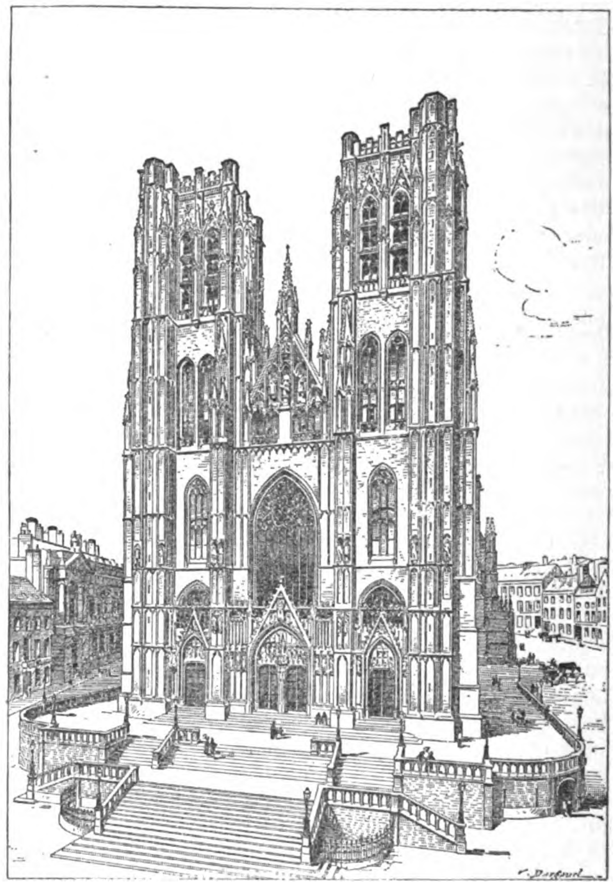

Fig. 3. Façade of the Cathedral of Brussels.

broad bays were constructed with it. The spires were themselves made of it as well as the accompanying turrets, which usually ran up to the summit of the towers. This gave rise, notably in old West Flanders, to a peculiar type of churches, among which may be cited those of St. Peter and Saint-Jacques, at Ypres, Notre-Dame, at Poperinghe, and the great church of Loo.

The three aisles of these edifices are of the same height and of equal width. They are covered, like the transepts and choir, with wooden vaults. It is to be remarked that, in general, the alluvium of the *littoral* here becomes perfectly white by baking, and this adds considerably to the monumental aspect of the brick structures. In Holland, where the clays are of a superior order, and where, from early times, especial care has been exercised in the manufacture of bricks, a quality possessing an exceptional degree of resistance has been obtained. It is due to the use of this first-class material that the builders were able, owing to the slight resistance of the Netherlandish soils, to turn their attention to diminishing considerably the weight of their constructions by reducing the thickness of the walls and the dimension of the supporting parts; they covered their churches, even the largest, with wooden vaults.

[To be continued.]

OFFICE-HELP FOR ARCHITECTS.[1]—VIII.

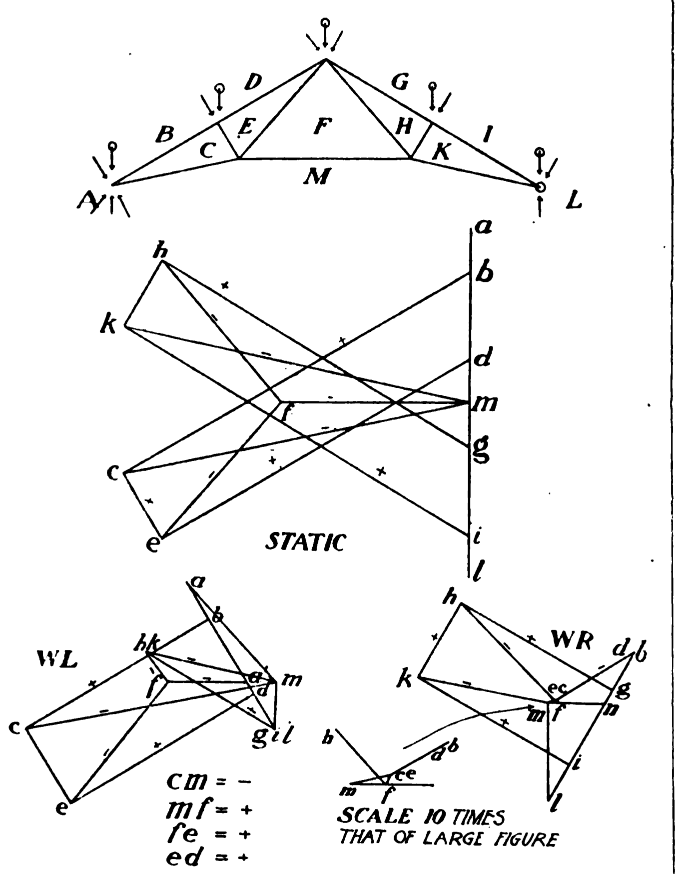

Fig. 29. Truss IV.

§ 183. Truss IV: (Fig. 29,) *Static-Load Diagram:*— Load-line *ab, bd, dg, gi, il, lm, ma.*

Joint *A*:— *ab, bc, cm.*
Joint *B D*:— *bd, de, ec, cb.*
Joint *C M*:— *ce, ef, f* ∥ *m, mc.*
Joint *D G*:— *dg, gh, hf, fe, ed.*
Joint *G I*:— *gi, ik, kh, hg.*
Joint *I L*:— *il, lm, mk, ki.*

Wind-Left Diagram:— Load-line, *ab, bd, dg.* Resultant acts in line *C E*, which prolong until it cuts *A L*. The parts

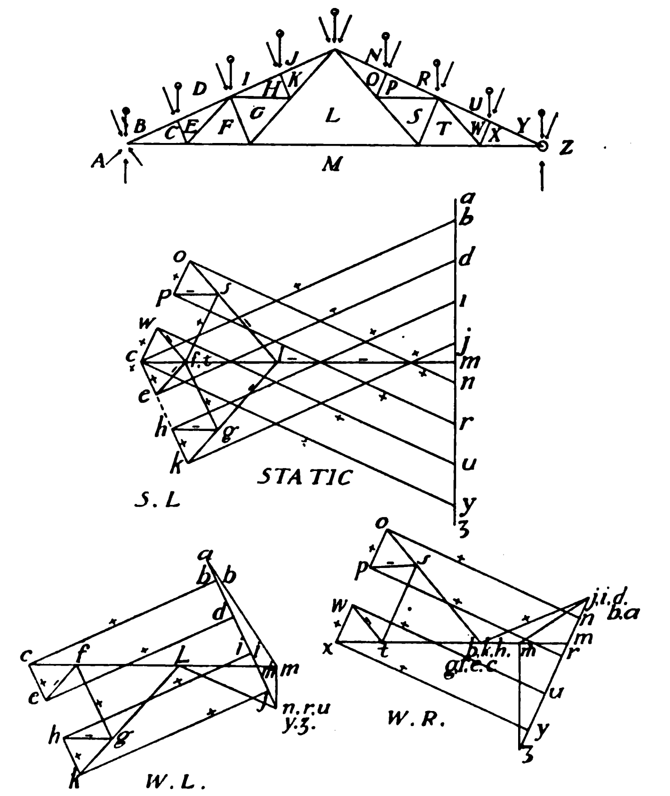

Fig. 30. Truss V.

of *A L* so cut will be proportional to the reaction of the abutments. This will fix point *m'*. Draw a horizontal line through *m'* and a vertical line through *g*, to an intersection in *m*: then *gm* = the vertical reaction at *L*, and *ma* the inclined reaction at *A*.

Joint *A*:— *ab, bc, cm, ma.*
Joint *B D*:— *bd, de, ec, cb.*
Joint *C M*:— *ce, ef, fm, m c.*
Joint *D G*:— *dg, gh, hf, fe, ed.*
Joint *G I*:— *hg, gi, ik, kh.*
Joint *M K*:— *hk, km, mf, fh.*

Wind-Right Diagram:— Load line as above.

Joint *L*:— *i l, lm, mk, ki.*
Joint *G I*:— *gi, ik, kh, hg.*
Joint *K M*:— *km, mf, fh, hk.*
Joint *D G*:— *dg, gh, hf, fe, ed.*
Joint *B D*:— *de, ec, cb, bd.*
Joint *A*:— *bc, c* ∥ *m, ma.*

§ 184. Truss V: (Fig. 30,) *Static-Load Diagram:*— Load-line, *ab, bd, di, ij, jn, nr, ru, uy, yz, zm, ma.*

Joint *A*:— *ab, bc, cm, ma.*
Joint *B D*:— *bd, de, ec, cb.*
Joint *C M*:— *ce, ef, fm, mc.*

Now, each of the other joints have three or more unknown

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[1] By George Hill, Consulting Engineer. Continued from No. 896, page 119.

ABBREVIATIONS AND SYMBOLS.

= equal to.
∥ parallel to.
÷ divided by.
× multiplied by.
\+ added to.
a^2 *a* multiplied by itself.
a>*b*:— *a* greater than *b*.
a<*b*:— *a* less than *b*.
$\frac{a}{b}$:— *a* divided by *b*.
∴ therefore.
□′ square feet.
□″ square inches.
8* read 8 pounds per lineal foot.
[channel bar.
I I-beam.
T T-iron.
L angle iron.
⊥ deck beam.
● round section.
1 ton = 2,000 pounds as this is the conventional ton, the legal ton is 2,240 pounds, but is rarely used.

l = the length between supports of any beam or girder or height of any column, always in feet.
b = breadth of any beam or girder, always in inches.
d = depth of any beam or girder, or the least transverse dimension of any column, always in inches.
L = total load uniformly distributed coming on any piece in pounds.
$L^{\square'}$ = " " " " per square foot in pounds.
W = concentrated load on any piece in pounds.
S = span of any arch or truss between centres of end pins in feet.
A = area of any section in square inches.
M = maximum bending-moment in inch pounds.
n = distance of centre of gravity of section from either top or bottom edge in inches.
I = moment of inertia, neutral axis through centre of gravity.
R = moment of resistance of section.
r = radius of gyration, in inches.
Sc = safe compressive strain in pounds per square inch.
St = " tensile " " " " " "
Ss = " shearing " " " " " "
S = strain per square inch in extreme fibre.
P_e = upward reaction of support at left-hand end of beam.
P_f = " " " " " right " " " "
e = distance of centre of gravity of load from left hand of beam.
f = " " " " " " " " right " " "

forces, and we must therefore establish some limiting conditions that will enable us to solve the problem.

We note in the frame; that *h i* and *jk* can be drawn in direction at once; next that *h k* = *c e*, that *gh* = *ef* and

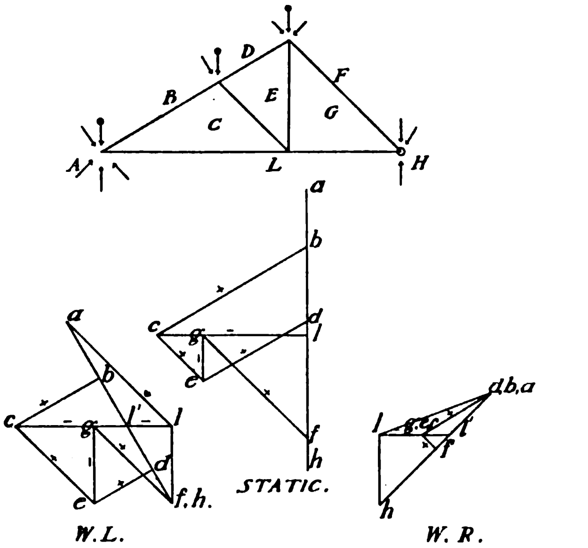


Fig. 31. Truss VI.

the direction *fg*, noting that *g* must fall midway between the lines *hi* and *kj*. Then we draw *hi* and *jk* extending them indefinitely; draw *f g* until *g* comes to a point midway between these two lines. Draw *gh* ∥ to *G H*, this gives *h*. *hk* ∥ *H K*, fixing *k*; then proceed.

Joint *D I*: — *di, ih, hg, gf, fe, ed.*
Joint *I J*: — *ij, jk, kh, hi.*
Joint *F M*: — *fg, gl, lm, mf.*
Joint *G L*: — *hk, kl, lg, gh.*
Joint *J N*: — *j n, no, ol, lk, kj.*
Balance, the same.

Wind-Left Diagram: — Load-line, drawn parallel to a line normal to rafter; resultant passes through centre of rafter, cutting tie in two parts proportional to those in which the load-line is divided. Through the division-point draw a horizontal line, and then from the *z* extremity of the line draw a vertical line *z m* to represent the *z* reaction, and *ma* to represent the *a* reaction.

Joint *A B*: — *ab, bc, cm, ma.*
Joint *B D*: — *bd, de, ec, cb.*
Joint *C M*: — *ce, ef, fm, m c.*

In regard to other joints, the note in the Static-Load Diagram applies. Draw the lines *i h, jk*, indefinitely; extend *c e* until it cuts them, giving us *h* and *k*; locate *g* as before.

Joint *D I*: — *di, ih, hg, gf, fe, ed.*
Joint *F M*: — *fg, gl, lm, mf.*
Joint *I J*: — *ij, j k, kh, hi.*
Joint *G L*: — *hk, kl, lg, gh.*
Joint *J N*: — *jn, no, ol* (coincident since *N O, L M, L K*, form a triangle and no strain can come on the interior bracing) *lk, kj*. This completes the diagram.

Wind-Right Diagram: — Load-line, drawn parallel to a line normal to the rafter, divided into two parts, at m^1, proportional to the parts into which the resultant of the wind-pressure divides the tie. Obtain the reaction of abutments *z m* and *ma*.

Joint *Z*: — *yz, zm, mx, xy.*
Joint *U Y*: — *uy, yx, xw, wu.*
Joint *X M*: — *wx, xm, mt, tw.*

Construct on *nr* a figure similar to the one just constructed on *uy*.

Joint *R U*: — *ru, uw, wt, ts, sp, pr.*
Joint *K R*: — *kr, rp, p o, on.*
Joint *J N*: — *jn, no, ol, lk* (coincident points), *kj*. *lm* gives tension in balance of tie and *kj* compression in rafter, other pieces not strained.

§ 185. Truss VI: (Fig. 31,) *Static-Load Diagram*: — Load-line, determine reaction of abutments as explained in § 174.

Joint *A*: — *ab, bc, cl, la.*
Joint *B D*: — *bd, de, ec, cb.*
Joint *D F*: — *df, fg, ge, ed.*
Joint *F H*: — *fh, hl, lg, gf.*

Wind-Left Diagram: — Load-line, normal to rafter, resultant passes through centre of rafter and fixes *l′* — *al, lh* are thus fixed as the reactions.

Joint *A*: — *ab, bc, cl, la.*
Joint *B D*: — *bd, de, ec, cb.*
Joint *D F*: — *df, fg, ge, ed.*
Joint *F H*: — *fh* (*coincident*), *hl, lg, gf.*

Wind-Right Diagram: — Load-line as above.

Joint *H*: — *fh, hl, lg, gf.*
Joint *D F*: — *df, fg, ge* (coincident), *ed* completes the diagram.

§ 186. Truss VII: — (Fig. 32,) *Static-Load Diagram*: — Load-line, *ab, be, ei, in, ns, sw, wj, j z* (= $\frac{1}{2}$ of total weight on truss), *zx, xr, rm, mh, hd, da* (= *j z* = $\frac{1}{2}$ of total weight).

Joint *A*: — *ab, bc, cd.*
Joint *D H*: — *hd, dc, cg, gh.*
Joint *B E*: — *be, ef, fg, gc, cb.*
Joint *H M*: — *mh, hg, gf, fl, lm.*
Joint *E I*: — *ei, ik, kl, lf, fe.*
Joint *I N*: — *in, no, ok, ki.*
Balance symmetrical.

Wind-Left Diagram: — Load-line normal to rafter, plot loads at each joint, *ab, be, ei, in*. Divide at *r′* into two parts, proportional to the two parts into which the tie is divided by the resultant wind-pressure, then draw *nr, ra:*

Joint *A*: — *ab, bc, cd.*
Joint *B E*: — *be, ef. fg, gc* (coincident since the frame *B G H*, is triangular without *C G*), *cb.*
Joint *H M*: — *gf, fl, lm, mh* (coincident), *hg.*
Joint *E I*: — *ei, ik, kl, lf, fe.*
Joint *I N*: — *in, no, ok, ki.*
Joint *M R*: — *ko, op* (coincident); *pr, rm* (coincident), *ml, lk*. Bracing in balance of frame not strained.

Wind-Right Diagram: — Load-line similar to Wind Left; reactions, *jx, xi*.

Joint *J*: — *wj, j* ∥ *z, z* ∥ *y, y* ∥ *w.*
Joint *S W*: — *sw, wy, yv*, (coincident); *vt, ts.*
Joint *R X*: — *tv, vx*, (same as *yz*); *xr* (coincident), *rp, pt.*
Joint *N S*: — *ns, st, tp, po, on.*
Joint *I N*: — *in, no, ok, ki.*
Joint *M R*: — *ko, op, pr, rm* (coincident); *ml, lk* (coincident).

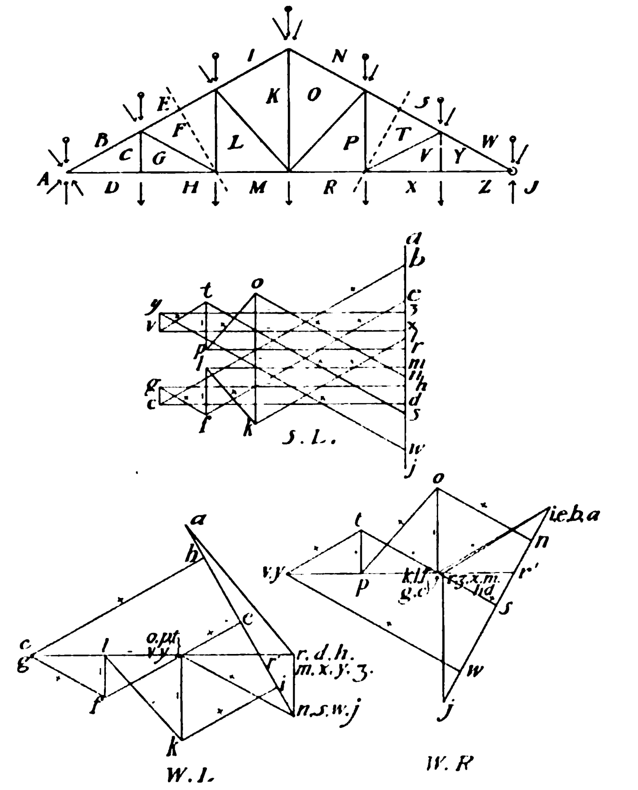


Fig. 32. Truss VII.

There are no strains in the bracing as the figure is triangular.

§ 187. Truss VIII: (Fig. 33,) *Static-Load Diagram*: — Load-line, *ab, bd, dg, gj, jk* (reaction, determined as explained in § 170 and as shown by dotted lines); *k l, l m, ma* (reaction obtained as above).

Joint A: — *ab, bc, cm, ma.*
Joint $M\,L$: — *lm, mc, cf, fl.*
Joint $B\,D$: — *bd, de, ef, fc, cb.*

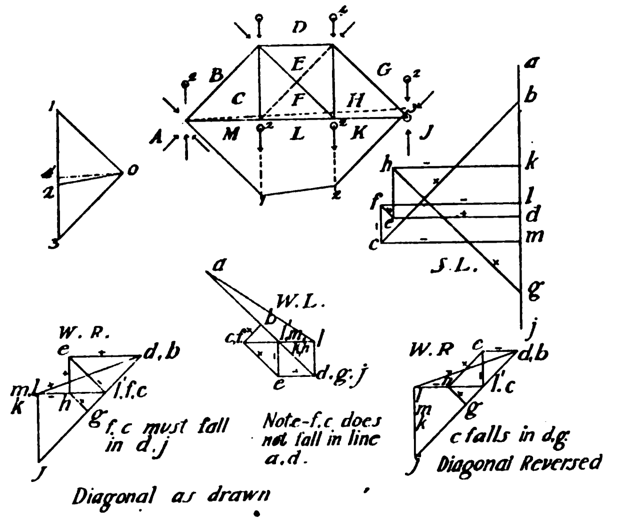


Fig. 33. Truss VIII.

Joint $D\,G$: — *dg, gh, he, ed.*
Joint $L\,K$: — *kl, lf, fe, eh, hk.*
Wind-Left Diagram: — Acts only on $B\,C$, resultant passes through $C\,M$. Load-line, *ab, bd, dl*, vertical, to a line through l' which is the dividing part of the load-line; *la.*
Joint A — *ab, bc, cl, la.*
No strain in $C\,F$, as there is now no load at $L\,M$. We therefore go next to joint $B\,D$.
Joint $B\,D$: — *bd, de, ef, fc* (coincident), *cb.*
Joint $D\,G$: — *ed, dg* (coincident), *gh, he.*
Joint $L\,K$: — *eh, hk, kl* (coincident), *lf, fe.*
Wind-Right Diagram: — (Diagonal as drawn full).
Load-line, same as $W\,L$.
Joint J: — *gj, jk, kh, hg.*
Joint $D\,G$: — *dg, gh, he, ed.*
Joint $B\,D$: — *de, ef, fc* (coincident), ($C\,F$ has no strain); *cb, bd* (coincident).
Joint $K\,L$: — *hk, kl* (coincident), *lf, fe, eh.*
Wind-Right Diagram: — (Diagonal as dotted).
Load-line as before. No strain in $F\,H$.

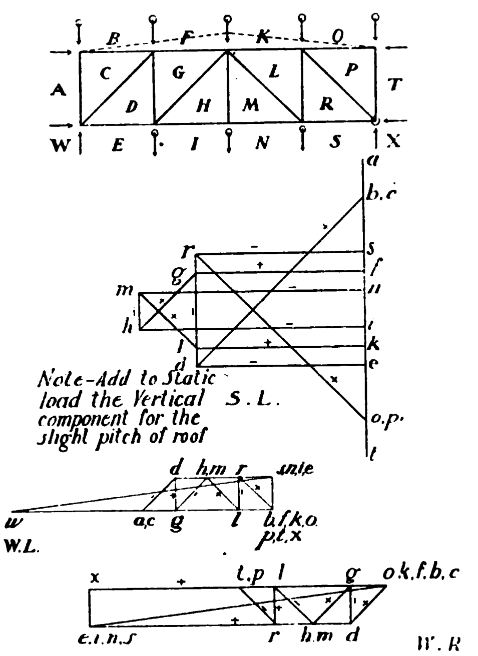


Fig 34. Truss IX.

Joint J: — *gj, jk, kh* (or *fl*), *hg.*
Joint $D\,G$: — *dg, gh, h f*, (coincident), *fe, ed.*
Joint $B\,D$: — *de, ec, cb, bd* (coincident).

Joint $M\,L$: — *ef, fl, lm* (coincident), *mc, ce.*

§ 188. Truss IX: (Fig. 34,) *Static-Load Diagram:* — Load-line. Note that, when used, a pitch roof is usually placed over the top chord and the vertical component of the wind thrust on this must be added as a part of the Static-Load. Note also that *ab* is carried now direct to the abutments and does not affect the top chord and ∴ there is no strain in $B\,C$ and direct compression in $A\,C$.
Load-line, *ab, bf, fa, ko, ot, ts* (reaction), *sn, ni, ie, ea.*
Joint W: — *ab* (*ac*), *cd, de, ea.*
Joint $B\,F$: — *bf, fg, gd, dc, cb* (coincident).
Joint $E\,I$: — *ie, ed, dg, gh, hi.*
Joint $N\,I$: — *ni, ih, hm, mn.*
Joint $F\,K$: — *fk, k l, lm, mh, hg, gf.*
Balance the same.
Wind-Left Diagram: — Note: add to load at $A\,B$ the load due to the projection of the roof. Now $B\,C$ becomes loaded. Load-line $=$ *wa, ab*; reaction at X, obtained thus; wind resultant passes through middle of $A\,C$, then *wb* multiplied by its lever arm divided by the lever arm of $X =$ reaction at X. This $=$ *be* in the figure; then, *e w* $=$ reaction at W.
Joint W: — *wa, ac* (coincident), *cd, de, ew.*
Joint $A\,B$: — *ab, bc, ca* (coincident).
Joint $B\,F$: — *cb, bf* (coincident), *fg, gd, dc.*

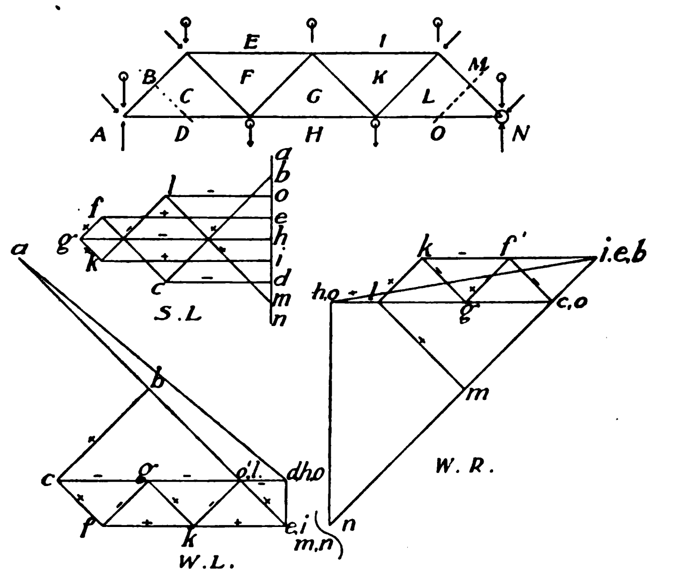


Fig. 35. Truss X.

Joint $E\,I$: — *dg, gh, hi, i e* (coincident), *ed.*
(No strains in $H\,M$).
Joint $F\,K$: — *gf, fk* (coincident); *kl, lm, mh* (coincident); *hg* (*hi* $=$ *m n*).
Joint $N\,S$: — *nm, ml, lr, rs, sn* (coincident).
Joint $K\,O$ — *lk, ko* (coincident), *op* (coincident), *pr, rl.*
Wind-Right Diagram: — Similar to Wind-Left Diagram in all respects.

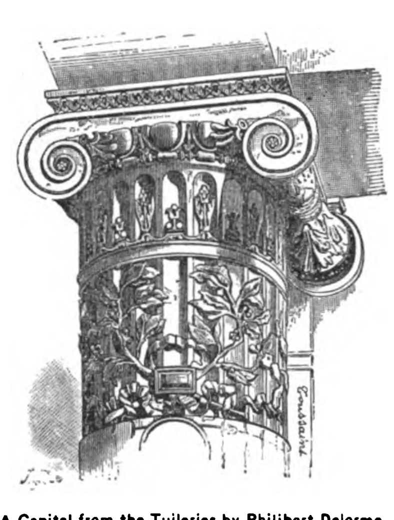
§ 189. Truss X: (Fig. 35,) *Static-Load Diagram:* — Load-line, *ab, be, ei, im, mn, no* (reaction); *oh, hd, da* (reaction).
Joint A: — *ab, bc, cd, da.*
Joint $B\,E$: — *be, ef, fc, cb.*
Joint $D\,H$: — *hd, dc, cf, fg, gh.*
Joint $E\,I$: — *ei, ik, kg, gf, fe.*
Joint $H\,O$: — *oh, hg, gk, kl, lo.*
Joint $I\,M$: — *im, ml, lk, ki.*
Wind-Left Diagram: — Load-line, *ab, be, eo, oa* (*eo* found by prolonging wind resultant and dividing load-line into parts proportional to the division of the tie and drawing horizontal line through points of division).
Joint A: — *ab, bc, cd, da.*
Joint $B\,E$: — *be, ef, fc, cb.*
Joint $D\,H$: — *dc, cf, fg, gh, hd* (coincident).
Joint $E\,I$: — *fe, ei* (coincident), *ik, kg, gf.*
Joint $H\,O$: — *hg, gk, kl, lo, ok* (coincident).
Joint $I\,M$: — *k i, im* (coincident), *ml, lk.*
Joint $M\,O$: — *mn* (coincident), *no, ol, lm.*
Wind-Right Diagram: — Load-line, *im, mn, no, oi*, reaction found as before.

Joint N: — mn, no, ol, lm.
Joint $I\ M$: — im, ml, lk, ki.
Joint $O\ H$: — kl, lo, oh (coincident), hg, gk.
Joint $E\ I$: — ik, kg, gf, fe. ei (coincident).
Joint $H\ D$: — gh, hd (coincident), dc, cf, fg.
Joint $B\ E$: — ef, fc, cb, be (coincident).
Joint $B\ D$: — cd, db, $b\ c$.

To be continued.]

CHINESE CURIOS.[1]—II.

JOSSES.



A Capital from the Tuileries by Philibert Delorme. From *L'Art.*

AMOY and Canton are places which supply travellers and curio-dealers with hideous idols, called "josses." They are manufactured, wholesale and retail, "moderns" and "antiques," orthodox or to order, as may be desired. I am sorry to be obliged to state that much of the joss business is a fraud, pious and otherwise. The regulation joss is either, a very fat and placid gentleman with a large genius for lolling, or a dignified, virtuous female with a superfluous number of arms and hands. But these styles did not suit merchants who desired to astonish their folks at home. So, to please their customers, the Mongolian joss-maker, with a keen eye for the main chance, turns out an assorted lot of clay hobgoblins warranted to freeze the blood of a small boy or produce hysterics in a nervous and dyspeptic girl. In this category come the man with the tiger face and ferocious fangs, the so-called "God of Hunger," who is only an every-day, half-starved opium-smoker, and the "Snake God," who probably is a phase of delirium tremens. None of these belong to Chinese art; they are simply "fakes," made for the markets of Christendom.

Joss-making is very simple. The manufacturer's chief stock in trade consists of wooden or metal moulds. In these the wet clay is put into shape and allowed to dry. It is then touched up, dipped in molten glaze, and allowed to cool. The average workman can turn out a hundred a day. The clay is kaolin, running from red and gray to snow-white, and costs about a cent per pound. The glaze is melted in a small charcoal-furnace, similar to the old-fashioned soldering-furnaces of retired plumbers. The wages of a good artist vary from twenty to forty cents per day. The cost of a fair-sized image is about three cents. He sells it for five cents to a native, and for as high as $5.00 to the credulous European or American tourist. The moulding, touching and retouching are the same in all the shops. The glazing varies indefinitely. It may be opaque of any color, transparent but tinted with any shade desired, or clear and colorless. The best work is made by painting the clay with heavy white paint and dipping in the glaze last described. In another kind of good work the clay is colored in caustic colors, kept in the heat until these have set, and then glazed as usual. The Chinese are very skilful in this field of labor, and with fine brushes will turn out josses that at first sight might be mistaken for cloisonné.

Antiques are popular with the dealers, as they can be planted and dug up to order from any desired age or dynasty and bring a handsome profit. The simplest is the black joss. It is made by painting a clay cast with a preparation of tar, bitumen, shellac, or Ningpo varnish, wrapping in several thicknesses of paper, and firing it in a kiln. According to the preparation and treatment, you can obtain a black-brown, red-black, blue-black, or a dark-gray product. The color sets through, so that a fracture discloses a very clean and uniform surface. There is little or no vitrification in this treatment, which makes the cast resemble a carving all the more. "Touching" removes any irregularities or defects, and also adds the signs of decay which usually accompany the flight of years.

Another and very different group of josses are those carved from wood and covered with gold and gay colors. Many of these are very ancient and are much more in demand than the pottery ware. They are carved with evident skill and retain their brightness for years. The prices vary according to size, workmanship and amount of gold or other decorations covering them. The smallest made are but an inch high and bring a few cents. The largest are ten to twelve feet high and cost $150 to $500 and upwards. In the larger sizes (say those of more than a foot high) the carving is admirable and the coloring life-like and very artistic. There are four of these large-sized josses in the famous temples of Lam-po-do, at the entrance of Amoy harbor, and they produce as imposing an effect as any collection of statues in the galleries of Europe.

Josses carved from stone are rare and dear. Great mandarins pay fabulous prices for small ones made from jade; those made of the pale-green and light-blue shades are much more valuable than the white, yellow or brown. Liu, the former governor of Formosa, owns a joss about eight inches high, which is said to be fifteen centuries old and to be worth $10,000. Small ones of one to two inches high seldom cost less than $200 to $250.

The difficulty of cutting the refractory stone is great and is the chief reason for its high price.

In Fuchau they make many josses out of steatite and selenite of various colors. These are rather neat and are very cheap. The softness of the stone allows the dealer to give a newly-carved image the appearance of great antiquity by rubbing it with a little fine sand. An hour's work removes all shape-lines and produces that effect which marks all ancient statues from the Sphinx downward.

SOAPSTONE FIGURES.

In almost every modern drawing-room there is an ungainly statue or carving in soapstone, which the owner vaguely says came from Japan, China, or somewhere in the far East. Where they really do come from is Fuchau, which, next to Amoy, is the greatest and most important city in the province of Fo-Kien. A few are carved in Amoy, Wenchow, Chan-Chan Foo and Canton, out of the soapstone rock which occurs in inexhaustible deposits in the vicinity of Fuchau. But neither in quality, much less in quantity, will the output of all these three places combined compare with that of the latter city.

The soapstone, or steatite, to use a more accurate word, is quarried almost like ordinary building-stone. It is singularly free from flaws or blemishes and often comes out in pure blocks of a cubic yard. The purest quality comes in smaller pieces. Fineness from a Chinese standpoint is a matter of translucency, color, and distribution of shading. No other steatite can compare with this in variety and brilliancy of color. In a collection imported from Amoy by Simon Muhr, Esq., of Philadelphia, there are objects in black, brown, maroon, carmine, indigo, ultramarine, French-gray, orange-purple, yellow, bister, sienna and opal. Usually a carving is made of one color, but some are even in polychrome.

The Fuchau carvings are famous in China and are found in every city and town. The simplest are basso and alto rilievos upon irregular plaques, ordinary plates and clumsy vases. The figure is a joss (the conventional deity), a patron saint, a hero, demigod or dragon.

Sometimes the artist is a portrait-cutter and, instead of an imaginary creature, turns out a very fair representation of a human being. The carvings of this class are very cheap, ranging from fifteen cents upward. The relief-portraits command prices from $1.00 to $5.00.

A second class of work is formed by articles of domestic utility — paper-weights, inkstands, joss-stick-holders, pin-boxes, jewel-cases, pedestals and the like. They are cut in simple geometrical forms, are highly polished, and decorated with floral designs and serpentine work. They are not dear, costing from five cents to $1.00.

A third class consists of statues and animal figures. The dragon, the "Dog of Happiness," the "Heavenly Poodle," "Buddha," "Sira," the "Goddess of Mercy," fishes, buffaloes and lions are the favorite designs of both maker and buyer. In size the carvings range from a mere toy half an inch high to handsome pieces of two feet square. There is a wide range of prices, a rough dragonet bringing a few coppers, while a large and well-executed "Goddess of Mercy" is quickly sold at $40 to $50.

A fourth class is essentially Chinese. They call it a "dramatic picture." It is a brave attempt to do in one piece of stone what Cellini did in a dozen panels of metal-work. The stone, taken as a whole, is carved into a conventional mountain with impassable roads, viaducts and caverns. At every point which pleases the artist's fancy is carved a human figure. They are out of perspective and out of proportion in every respect. Two warriors, for example, are fighting on a bridge whose timbers are like matches. Two lovers are trembling in a cavern, while the girl's irate father, as large as a baby, confronts them at the entrance. A horse whose head is larger than his trunk is about to be devoured by a dragon the size of a mouse. So the incongruities run on. In spite of the ludicrous unnaturalness, the workmanship excites admiration. The infinite patience with detail, the enormous labor expended upon the work and the charming chromatic effect from the well-chosen colors of the steatite are worthy of a high and noble art. These dramatic pictures are not over-costly. They range from $1.00 to $25 apiece. The native artist is a poorly-paid fellow. He is satisfied with thirty-five cents per day, while his apprentices are delighted with even much less. They belong to a powerful guild which has a history of ten centuries, and are as proud of their art as an R. A. is of his productions with the brush.

CASH.

Collections of "cash" are of considerable interest. They are small coins of bronze, brass, copper or silver, ranging in intrinsic value from one-twentieth of a cent to twenty-five cents. The oldest of these coins on record appeared about 2300 B. C. Over 150,000 different kinds of cash are preserved in collections. Some are wonderful examples of coinage, but most of them are clumsy and coarse

[1] Continued from No. 897, page 138.

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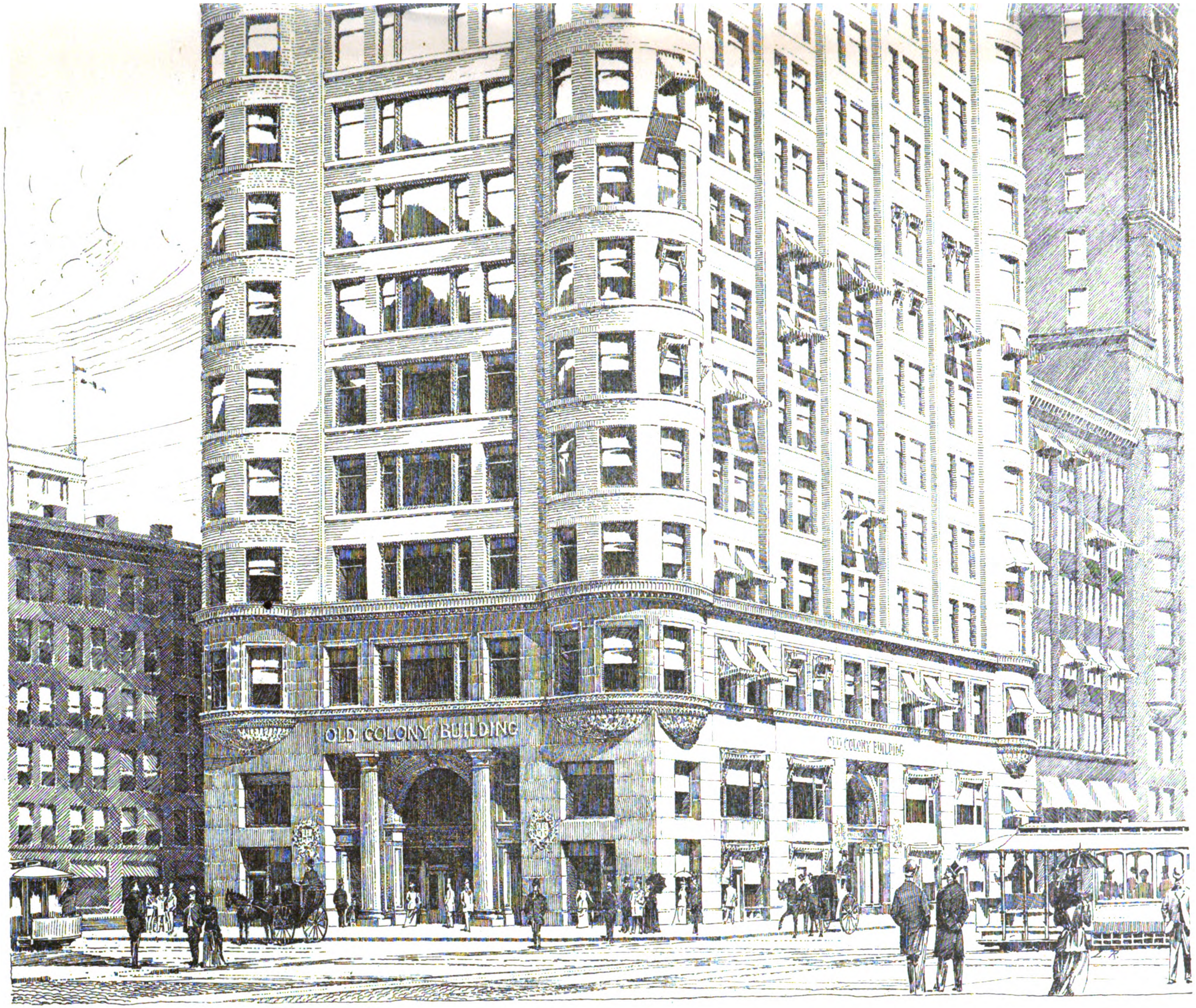

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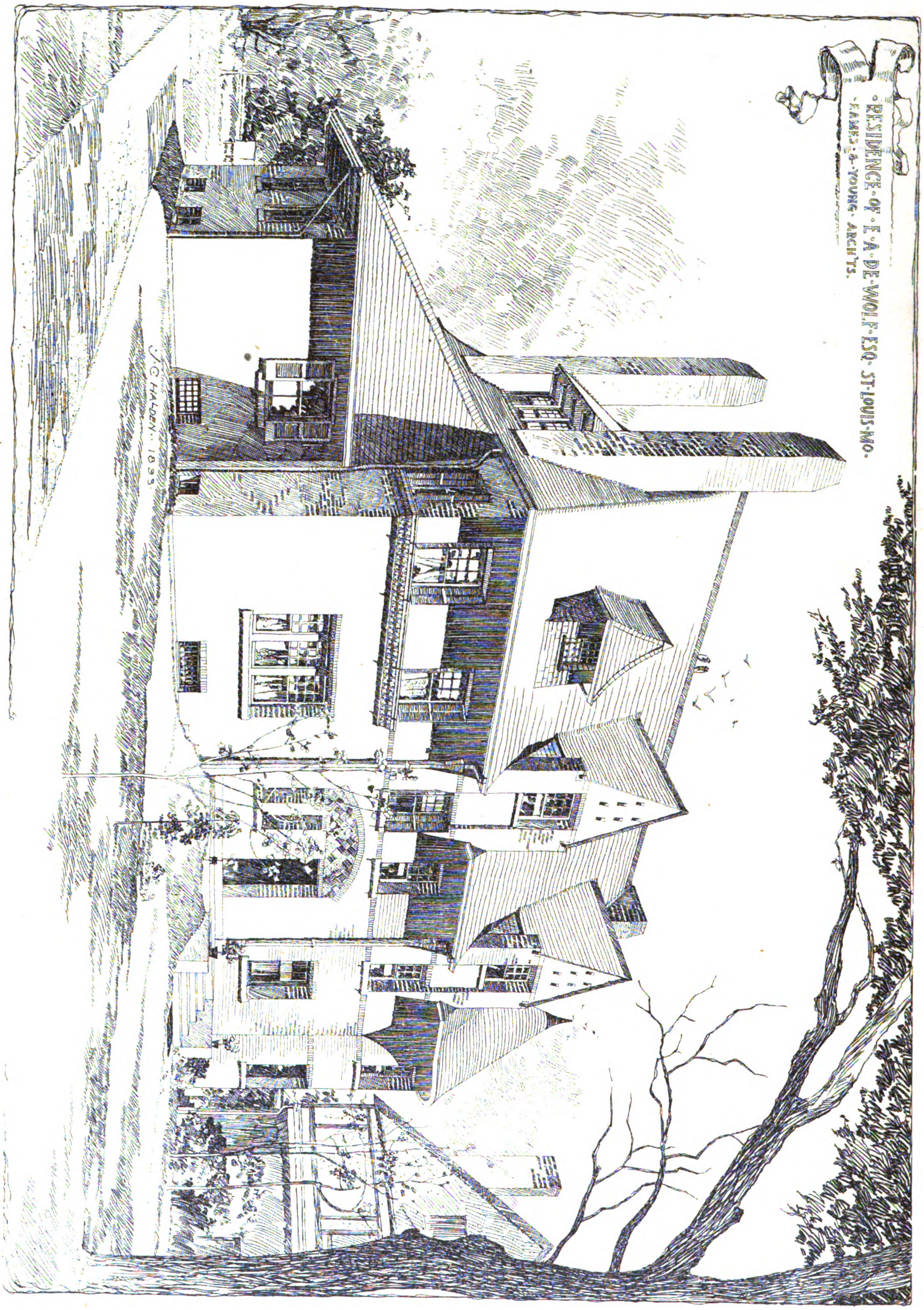

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DINING ROOM 16'0" × 22'0"
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MUSIC ROOM 17'0" × 26'0"
TERRACE

THE HOVSE OF EVGENE FELLNER ESQ on Aspinwall Hill Brookline Massachusetts Messrs Cram and Wentworth *whose Office is at Number 53 State Street* being the Architects

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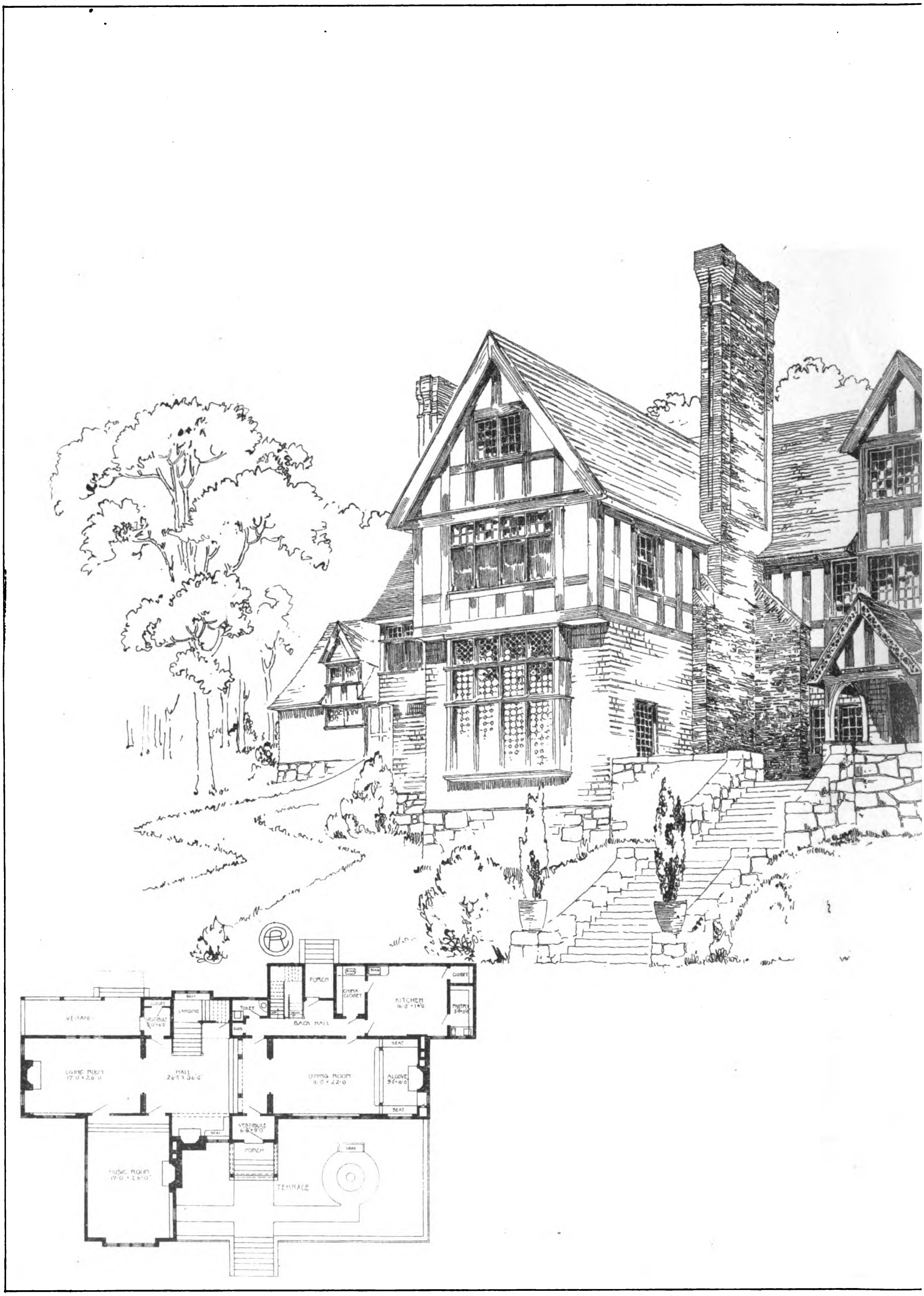

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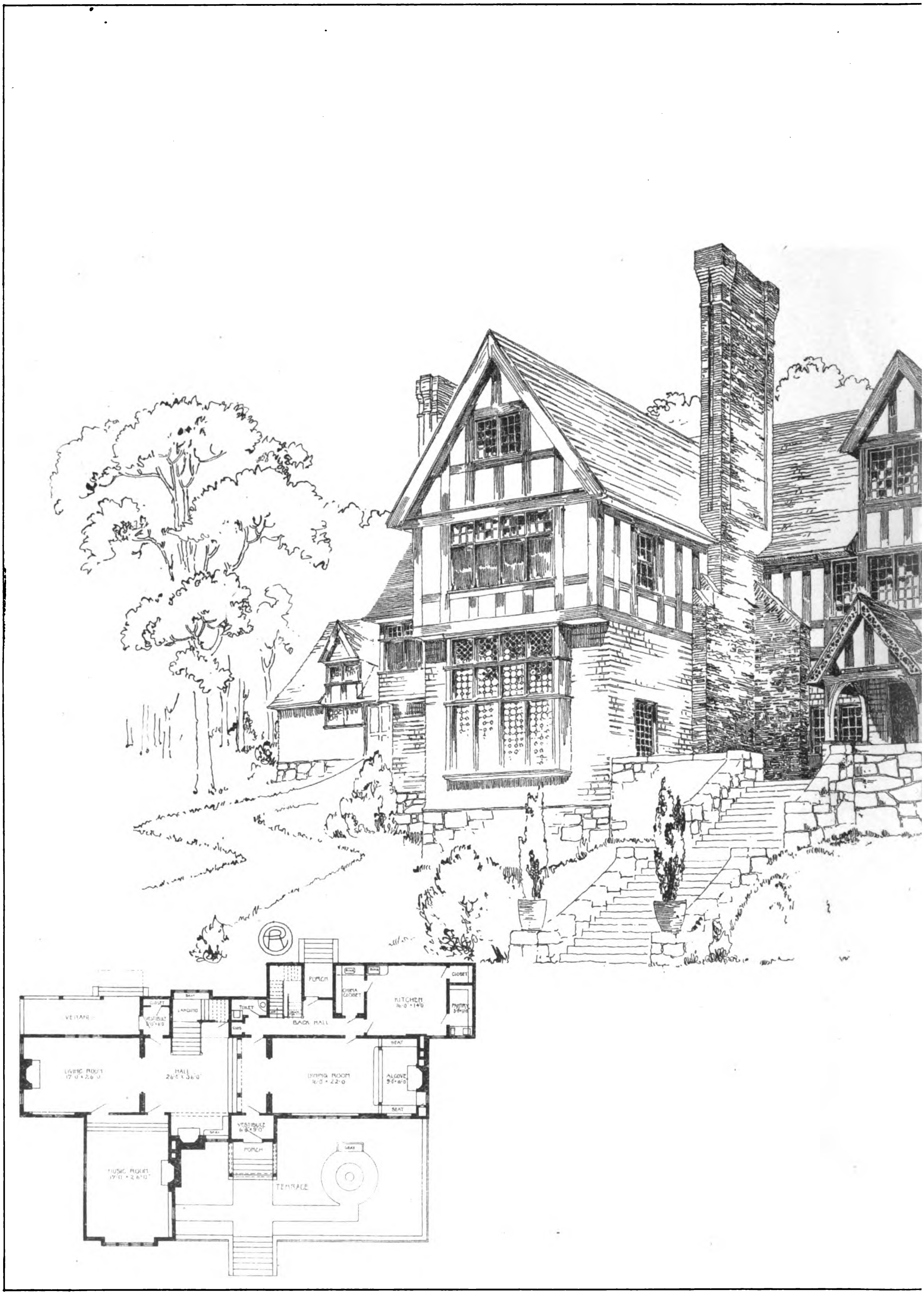
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is at Number 53 State Street being the Architects

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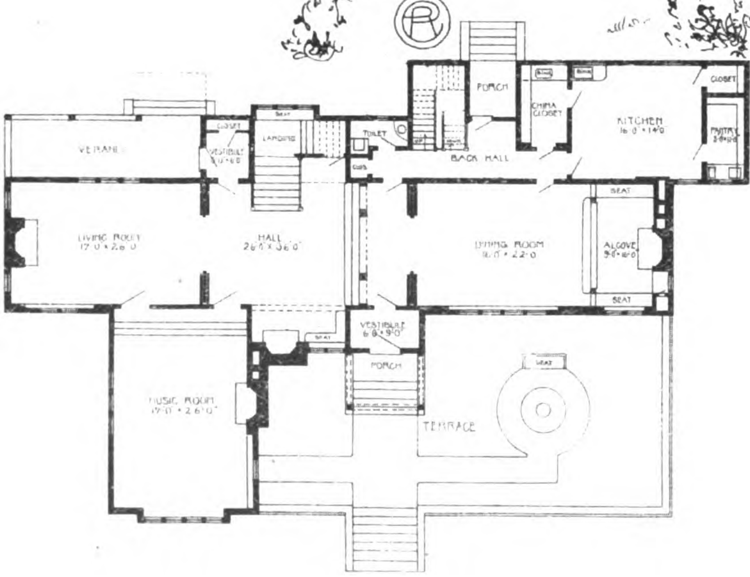
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TERRACE

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Meſſrs Cram and Wentworth *whoſe Office*
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In this field the East is a paradise for the numismatist. He can work all his life, spend very little money, and leave to posterity thousands of coins. All he need do is to confine his work to the collection of cash, the small coins in brass and bronze whose value ranges from one-tenth to one-fourteenth of a cent. Their workmanship varies, but is usually very good. Their shape to-day is like that of European coins, with the exception that through the centre is a square hole through which the coins are strung together like beads. In the past, however, other forms were employed, including the square, triangle, heart, ellipse, shield, key, sword and spear. The number of kinds is simply immense. They are referred to in Chinese literature as far back as 250 B. C. The earliest that I have heard of dates from the Ts'in dynasty, which ruled from 255 to 207 B. C. From that time until to-day these useful little coins have been issued by every monarch, no matter whether he was emperor of the entire country or king of one of the petty principalities into which from time to time the Chinese Empire was broken. There have been over 1,200 occupants of the various thrones, royal and imperial. In addition to these regular issues, if such they may be called, there have been special issues from time to time, and also special local issues. A wealthy mandarin in Canton is said to have the finest collection extant, containing 25,000 specimens of different kinds.

The cost increases as you go backward in time. The cash of this century can be secured at their nominal face value. Those of the eighteenth and seventeenth centuries bring from one to ten cents each. Those of the Han dynasties, from A. D. 206 to A. D. 100, bring $100 each when in fine state of preservation.

These true antiques are found in ancient tombs and ruins. Several hundred were discovered in Amoy this year in digging a grave, when the laborers broke into an old tomb several feet below the surface of the soil. The coins lay in a pretty earthenware jar, and were incrusted with a thin layer of malachite that here and there had been changed by moisture into azurite. The coins were sold by the lucky coolies in the next twenty-four hours and are said to have brought one dollar apiece, an immense sum to men working for twelve cents a day.

To succeed in collecting cash a person must be a fine Chinese scholar. The labor thereby involved is so severe as to preclude most collectors from indulging in the pleasure to any great extent.

TEA-ROOT CARVINGS.

For more than a hundred generations there has been a guild of artists in the province of Fo-Kien whose life-work is the carving and modifying of the gnarled and interlaced roots of the tea-tree into things of beauty — that is, beauty from a Celestial point of view. The herb whose leaves gladden Western palates in the form of Oolong, Hyson and Souchong is a hardy plant and takes a firm hold on mother earth. Its roots seem to have no regular law of growth. Sometimes they develop very much as a beard sprouts from the chin; at others they separate and move along in parallel lines as if they were a lignose centipede. In general, it may be said that they make a large, clumsy mass, from which shoot out anywhere from three to thirty rootlets. Their surface is never smooth, but always irregularly corrugated. The value of a root depends upon its size, its outline, its freedom from decay, and its suggestiveness of some everyday object. It is rare that a main root or root-mass is more than six inches in diameter. Such belong to trees ranging in age from thirty years to a century. Infrequently they attain to twelve and fifteen inches, and are then said by Chinese experts to be four and five hundred years old.

The roots are dug from the soil and allowed to thoroughly dry in the open air under a shed or else in a moderately warm room. The loose earth is carefully removed, as is the loose bark and all pieces decayed, cracked or worm-eaten. The artist then determines what it is to be. The favorite types are dragons, buffalos, cows, carnivores, bears, mandarins, priests, howling dervishes, dancers or mythical heroes. If the root cannot be worked into one of these shapes, it is converted into a pedestal or platform for a figure-piece. The primary operation consists in sawing it into rough shape. This is done with a fine cross-cut saw and the clean edges removed by rubbing them on tiles or bricks. Sometimes a root is bent by softening it with steam or boiling water, and then twisting it in any desired direction. Now comes the hardest task of all. The most valuable piece is that which shows no art and seems perfectly natural. The carver goes over the block, removing here a fibre and there a set of roots, here thinning out one on the under side and forcing it down, and there burning another and expanding it at the burned point. I have one in my drawing-room which is a capital figure of a dragon, rearing, and opening his jaws as if to spring upon his prey. Careful examination shows that nothing has been added to the mass, but that hundreds of fibres, knots and corrugations have been skilfully removed.

In nearly every instance a human figure made in the same manner or carved from wood of the same color, or else made partly from tea-roots and partly from carved wood, is added to the first piece. The designs are endless in this field. Learned men lecturing, birds, mandarins standing on dragons, boys riding cows and other ridiculous quadrupeds, dancing beggars and men fighting each other are the commonest groups, but of the more uncommon there are thousands. One famous artist in Fuchau claims to have produced, with the aid of his apprentices, over fifty thousand different designs, and, judging from his stock on hand, his claim seems reasonable enough.

The tea-root carvings are seldom very costly, running from fifty cents to $100. Nine-tenths bring less than $2.00 each. A handsome set of a dozen can be purchased for $20, which will decorate a drawing-room or hall better than bric-à-brac many times more expensive. The figures are strong, durable, and in no danger of fracture by servants. Outside of their æsthetic value, they are of interest in showing the wonderful ingenuity and economy of the Chinese.

"FIGURETTES."

An odd art-industry in Amoy is the making of tiny images, which are variously known as "figurettes," or "little devils." They are statuettes ranging from half-an-inch to three inches in length, and are moulded from a paste whose composition is a trade secret. It would be better to use the plural than the singular, for each community of modellers uses a paste different from that of the others. Among the ingredients employed are hard wax, insect-wax, glue, vegetable gum, linseed gum, papier-maché, burned umber, sepia, kaolin, ultramarine, yellow ochre, chrome-yellow, vermilion, white-of-egg and pulverized egg-shells — rather a wide field to choose from. The backbone of the figure is a stick of hard, dry wood, left rough to give a better purchase to the paste. Upon this are moulded the head, toes and one leg. The other leg and the arms are stiffened by wires or thin pieces of wood. The coarse work is done by boys, girls, women or apprentices, who are remarkably quick and skilful. They use their fingers in outlining and a variety of little wooden tools in producing textures, hair, beards and weapons. The figures are then handed over to the artists, who are always men. They finish the features, give an expression to the face, and remedy any defect or mistake of their subordinates. The figures are then carefully dried. According to the composition of the paste, this is done in a warm room, a cool current of air, a kiln, or the open sunlight. The best kinds are dried in a warm room and require from three to eight weeks before they are thoroughly done.

The figurettes are divided into two classes — toys and art-objects. The former are built upon long sticks, like jumping-jacks. The wired arms are jointed loosely to the body, so that when the stick is whirled they gyrate in a very amusing manner. The workmanship is coarse and the cost a mere trifle, ranging from one to two cents per figure or from ten to twenty cents per dozen. The other kinds are built upon short sticks, which are fastened into small wooden platforms so as to stand upright. Their workmanship varies, some being rude and clumsy and others very fine. Their variety is infinite. One set of one hundred represents all the characters in a great classic drama. Another set of the same number embodies the various types in the armies of an heroic Chinese king and a savage monarch whom he has conquered. A third consists of two hundred figures of the various vocations of daily life. Other sets are those of distinguished generals, famous kings, heroic queens, poets, law-givers, engineers and admirals. The leading artist in this quaint industry claims to carry five thousand separate faces in his memory and to be able to reproduce any one in paste at the word.

The figurettes are made in colors or monochrome. When colors are employed, the greatest care is bestowed upon the correct tinting of details. The crown is gilt, the bracelets silvered, and the coats, undercoats and trousers colored according to the style and age to which they belong. The historic accuracy in many cases is admirable. On the other hand, the modelling of colored figures is usually mediocre or worse. The features are poorly outlined and the fingers, weapons and ornaments indicated rather than moulded.

In monochrome the reverse is the case. The paste is dark-red, brown or brown-black, and every detail is wrought out with the greatest care. On a figure an inch in height the eyelids, ear-ring-holes and finger-nails are often so well executed as to bear scrutiny with a strong magnifying-glass. As might be supposed, the cost of this class is higher than that of the other, and runs from three to six cents per figure or from thirty to sixty cents per dozen. How the artist manages to live upon the rates is a profound mystery.

The Chinese have a happy knack of displaying all kinds of figurettes by placing them in miniature theatres, temples or pleasure-grounds. A glass box 8 by 10 by 5 inches containing diminutive trees, rocks and twenty-five figures can be purchased for $1.00.

Next to a trip through China, nothing can give a better notion of the endless variety and brilliancy of costume than a set of two hundred figurettes, or "little devils."

CARVED FRUIT-STONES.

Nothing is wasted in China. The stones of various fruits and the shells of nuts are cleaned, dried and carved into ornaments of the most graceful kind. Among the stones used are the olive, plum, peach, lai-chu and cherry, and of the shells the walnut and cocoanut. The stones are selected with care; each must exceed a certain standard of size, proportion, hardness and weight. They are dried slowly and at such a heat as not to crack or sprout, and are then ready for the carver. The designer marks a rough outline of the future group or picture and hands it over to his boys or apprentices. These work with great rapidity and soon block out the design, cutting through the hard ligneous tissue, and then extract the kernel. A second treatment now takes place to dry the interior of the stone, as well as to prevent the fine lining of the interior from undergoing decomposition. This completed, the designer sketches a second

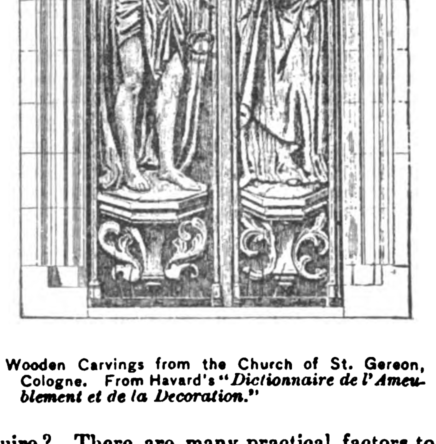
outline, and also indicates by his pencil or brush where the surface is to be lowered, pelted, made into leaf-work or arabesquery, or be cut altogether away. The work is performed by the subordinates as at first. The designer then does the finishing touches, after which the assistants clean, polish, and oil or wax the perfected carving.

The stones are sold in this shape to quite a large extent, but more largely in other forms. Among these may be mentioned buttons, watch-charms, sleeve-links, ear-rings and brooches, and, when strung together, bracelets, anklets, necklaces, watch-chains, rosaries and official ornaments.

The price of a stone varies greatly with the workmanship and the fame of the carver. Some may be bought as low as ten cents apiece, others command as high as $2.00 and $3.00 each. The average price is thirty cents a stone, with a handsome discount for purchases in quantity. The carvings display great variety and beauty. One class represents bunches of flowers and leaves, in which pistils, stamens and tendrils are accurately executed. Similar to these are fruits and flowers and flowers and leaves. A second class is composed of carvings of birds, reptiles and higher animals. The dragon, griffin, stork, snake, horse, lion, tiger, camel, elephant and bull are the favorite figures. I do not recall ever having seen a cat, dog, wolf, sheep, goat, or other animal beyond those specified. A friendly mandarin, to whom I stated this, said that a canon in Chinese carving was to reproduce only those animals which had been deified, and that the ten mentioned were about the only ones which had enjoyed divine honors. A third class, and by far the most interesting, comprises groups of human figures representing scenes in history, poetry, mythology and the drama. The workmanship is often so fine as to be microscopic in its delicacy. In fact, the finishing touches are made by the artist while using a magnifying-glass of at least fifty diameters. On stones not over an inch in length along their major axis it is not uncommon to find eight, nine and ten characters in different attitudes and costumes. Unlike most phases of Chinese art, there is much regard paid to perspective and fore-shortening. Some of these pieces might have been made by Hindoo or Italian artists, so free are they from local or racic conventionalism. Nevertheless, in the main, conventionalism is all-prevailing. Dignity always wears a beard, and low comedy, with villainy, is disguised with queer markings and quaint attitudes. The horse has a head twice too large, and the dragon carries a tail which in real life would have insured his prompt destruction. Gods wear queues and goddesses stroll about on compressed feet. But was there ever a school of art of any sort free from conventionalism? Even were there one, it would probably be as unsatisfactory as the most artificial systems of our own civilization, or of this strange and mighty one upon the borders of the China Sea.

EDWARD BEDLOE,
U. S. Consul, Amoy.

THE PROBLEM OF HEATING HOUSES.



Wooden Carvings from the Church of St. Gereon, Cologne. From Havard's "*Dictionnaire de l'Ameublement et de la Decoration.*"

I DO not intend to go into the technical problems and arrangements, only into the caloric problem of heating houses. It may be said that the following is an attempt to give a practical theory of what amount of fuel might be needed to keep a house comfortably warm, and as a basis for computing how much is really used and how much is wasted.

We take, as an example, a room of 10,000 cubic feet, because from such a supposition we can transfer the same calculation to a house of any given number of cubic feet. It is now the practical experience that such a room requires from three-fourths to one ton of coal per month. How much ought it to require? There are many practical factors to be taken into account.

1. The loss of heat through cracks, untightness of windows, floors and ceilings.

2. The loss of heat from opening of doors by people coming in and going out.

3. The loss of heat through conduction, walls, windows, etc.

4. The amount of heat absorbed in warming-up the walls, ceilings, floors, windows, furniture and persons, or rather their clothing, who come in from the cold air.

5. Warming-up the air in the room.

To give the calculation a practical aspect we will suppose an outside temperature of 10° F., the room to be kept at 70° F. For the purposes of calculation I will drop for the moment that abominable slang called English weights and measures, considering that the United States is not England, and will go to the metric system, — to return, when we reach the practical conclusions, again to that perversity called the English system.

The size of the room we suppose to be 10,000 cubic feet = 283 cubic metres.

Supposing that room to be 50 feet (15.2 metres) long, 20′ (6.08 metres) wide, and 10′ (3.04 metres) high, the floor area of this room is 92.4 square metres, the ceiling, 92.4 square metres, the walls, 129.4 square metres.

Supposing the windows to be one-fourth the area of the walls; we have 32.4 square metres window-space; three doors, each 2 square metres = 6 square metres.

We will not consider for the present the first heating-up of the room, but suppose that the room has reached 70°, while the temperature outside is 10° F.

1. Considering the cracks in the average building, we will not be far off in supposing that, in total, they add up for our supposed room very nearly to one square foot, or 0.035 square metres.

With a difference of temperature of 10° outside and 70° inside, the average speed of the air rushing through such an opening will be about four miles an hour, or 5.85 feet per second, or 1.78 metres; hence the cracks in this wall supply every second 5.85 cubic feet or 0.11 cubic metres of air of 10° F. (–13° C.) to be heated to 70° F (21° C.), or a difference of 60° F. (34° C.).

As the specific heat of air by volume is 0.24, every second 0.0264 metric kilogrammes calorics have to be supplied to warm the in-rushing air through the cracks 1° C. or 0.9 metric kilogrammes calorics from 10° F. to 70° F.

As one pound of excellent coal (0.46 kilogrammes) gives 3,200 metric calorics when fully utilized, the amount of caloric needed by the in-rushing air represents in one hour almost exactly one pound of coal.

2. Every time a door is opened and kept open for five seconds the same rules may be supposed to hold good in regard to the in-rushing air. This represents for every opening of the door 10 cubic metres of cold air, because the upper half of the door will be filled with warm air going out; every opening represents 85 calorics, or, supposing 60 openings of the door per hour, 5,100 calorics = 1.6 pounds of coal; hence what we may call the factor of air exchange is made up of the following losses of heat per hour in pounds of coal:

Cracks, pores, etc.	1.0 pounds of coal per hour.
Opening doors	1.6 " " " " "
	2.6 pounds of coal per hour.

3. Loss through conduction and radiation. From experiments of Wiedman, the transmission of heat through walls is represented by the formula $L = \dfrac{D \times Q}{O\,(T^1 - T^\circ)}$

in which formula L represents a constant figure, D the thickness in square metres, F the quantity of metric calorics per hour, O the area, and $T^1 - T^\circ$ the difference in temperature of the two sides of the heated surface in centigrades.

L for various substances has the following value: Glass, 0.815; wood, 0.17; brick and stone, 0.06; granite, 2.4.

These figures apply to the case of our room, and have somewhat to be modified according to the construction of the room. It would not be difficult to carry them out in detail for every window-frame, wall, door, etc., but we will average the thickness of the walls exposed to the outer air as 12″ stone. The inner walls dividing our supposed room from other rooms, being equally heated on both sides, may be eliminated in our case, because they neither give nor receive heat. We find that the area of the outer walls is 63 square metres; the windows occupy one-half that space, hence we get 31½ square metres of a thickness of 12″. Introducing these data into our formula, we get a transmission of 2,100, or equivalent to a consumption of coal of 0.69 pounds per hour.

The windows, occupying about 15 square metres against the open air, give a loss of heat, using the above formula, of 7,000 calorics per hour = 2.2 pounds of coal per hour; window-sashes, frames, etc., 800 calorics = 0.35 pounds of coal.

The ceiling is a special source of loss of heat. Through this factor, supposing it to be of lathes and plaster, with an average factor of $L = 1.1$ and a thickness of 2″, we obtain a loss of 10,500 calorics, or 3.2 pounds of coal per hour.

Hence the total amount of loss by conduction gives the following amounts:

Walls	0.69 pounds of coal per hour.
Windows	2.20 " " " " "
Sashes, frames, doors	0.35 " " " " "
Ceiling	3.20 " " " " "
	6.44 pounds of coal per hour.

The floor does not offer a source of loss of heat. It may, on the

contrary, contribute heat to the room from a room below; hence it may be properly omitted.

A source of loss of heat is also from the entrance of people into the room. Supposing their outer clothing to be the same temperature as the outer air, and this clothing to weigh ten pounds per person, every time such clothing is warmed in the room there are abstracted 85 calorics, or, for sixty persons an hour, 5,100 calorics = 1.5 pounds of coal.

As this computation may form a basis for comparison, I have expressed all the figures immediately in their equivalent of coal. This gives a total hourly need of coal of:

For cold-air exchange............	2.6 pounds.
For conduction of heat...........	6.4 "
Persons entering the room........	1.5 "
	10.5 pounds.

Our knowledge of the problem would admit of an exact calculation of all the details, even to the extent of the loss by radiation from door-knobs, window-catches, condensation of frost, etc., if necessary.

With a similar calculation, the consumption of a house having a a given number of cubic feet can be calculated, including only the rooms and space to be heated. The quality of heating-apparatus may be judged by a comparison of the actual consumption of coal compared with the theoretical one from the above formula.

We have to consider also a very large number of factors, which, as a rule, all tend to increase the consumption of coal:

1. The ventilation craze of people. They do not consider that through the unintended openings and cracks a thousand cubic feet of fresh air enter the house every day, but persist in having the windows open.

2. A flimsy structure of the house, allowing the wind to blow through clapboards and partitions.

3. Exposure, and probably fifty more special points might be accumulated; but with the liberal allowances made in the case of our room, it may be said that if in any house there is more coal used than ought to be, from a deduction of the cubical contents and the various other data, that something is wrong, and ought to receive attention.

The conclusions would be for every 1° F. difference between outdoor and indoor air 80 pounds of coal are needed for a space of 10,000 cubic feet, with free exposure; indoor to be kept at 70° F.

Supposing a house to be 50 x 30 deep and 30 feet high = 45,000 cubic feet, heated all through to 70°, the monthly average 32°, the house would reasonably require 4.5 x 38 x 80 = 13,480 pounds of coal for this month, or 6.7 tons.

If the average of the winter months (October to April) be 45°, the consumption would be 4.5 x 25 x 80 x 6 = 54,000 pounds, or 27 tons.

But economical handling (nights) or satisfaction with less heat (65°), shutting off rooms and halls, will reduce the amount materially in practice, and probably 20 tons would amply suffice.

C. M.

CREMATING GARBAGE.

THE New York *Times* says that in a recent address before the Woman's Health Protective Association of New York on the subject of the disposal of waste or refuse matter in cities, Col. W. F. Morse, a well-known sanitary engineer, said:

"If the City of New York can burn at the foot of East Sixteenth Street, as it has for three years past, the infected bedding, clothing, furniture, and hospital waste from patients ill or dead with infectious disease, such as diphtheria, smallpox, typhus and cholera, with no chance for the escape of the germs of the disease or any fumes of nuisance or smoke, then it is entirely possible to destroy, at any convenient location on the water-front, the garbage which is brought out from the houses.

"It is only a question of necessity, desirability and of final expediency. If Chicago, with its million and a quarter of inhabitants, can spend $75,000 for the cremation of its garbage, and if Philadelphia, with its million of people, can by its ordinances declare that its garbage shall be cremated, why should New York insist that its garbage must be used for the purpose of making ground on an island in the Sound twenty miles from the city?

"The question is one which should not be considered from any standpoint other than the sanitary protection of the public. The matter of cost for the construction of furnaces and of operation is no more than is paid for the actual building of scows and the employment of tugs and men to tow the waste twenty miles. An estimate made two years ago pointed out the fact to the Health Department that, whereas it cost eighteen cents per cubic yard to tow this material outside of Sandy Hook and dump it into the ocean, it could be burned within the confines of the city for less than twelve cents per cubic yard.

"Unlike most other cities of the country, New York early adopted the method of towing out to sea and dumping on the edge of the harbor the great bulk of matter which was worthless. After many years' experience of this method, the annoyance and trouble resulting from it, together with the unsanitary and objectionable way in which it was done, and which could not seem to be avoided, became so great that the authorities, under pressure of public opinion, devised a plan by which, instead of dumping it into the ocean, all the waste of New York should be carried to an island in the Sound and there deposited to manufacture ground, which was to be afterward used by the city.

"Now this is a clear case of jumping from the frying-pan into the fire. Instead of any gain by the change being had, there is positive loss. The same length of haul of garbage takes place through the city's streets to the scows, and then the stuff is towed-up between the two cities of New York and Brooklyn, over an even greater water thoroughfare — the East River, where crowded ferry-boats and Sound steamboats are constantly moving — than down the bay to Sandy Hook. And the result of this operation of making land with putrescible, decaying substances of every kind, according to the record and statements of the best sanitarians, is that ground so manufactured or built-up of matters which in themselves undergo fermentation and decay is of such character as to produce disease.

"There are numberless instances where it can be positively proved that persons dwelling on such ground are subject to zymotic diseases, from which their neighbors living on original ground are free. A statement has been made by a distinguished sanitary expert of this city that whenever an outbreak of diseases, such as diphtheria, typhus, scarlet fever, etc., appears in New York, they follow the course of old streams or creeks which have been filled-in and built upon. Now, if this be true (and there is every reason to think it is true) in the city of New York, where the drainage facilities are the very best, how much more must it be true of ground which is wholly made out of putrescible matter?

"A proposed remedy for the garbage nuisance is the destruction in each individual house of its own waste. This is practicable in many cases, but probably not more than five per cent of the population of this city feel it their duty to contribute to the welfare of the whole by burning such material as would give offence when cast into the garbage heaps. It is not always best to burn in the kitchen stove the general refuse of the family, and if it were, it would still be difficult to persuade a servant that it is healthier to cremate the garbage in the family range rather than cast it into the nearest ash-barrel. The application of this method in the crowded tenements in the lower part of the city is absolutely impossible.

"The experiment has been tried to a large extent in Brooklyn, with the result of destroying stoves and ranges, and in many cases creating a nuisance by the emission of fumes from the chimney. The best reform in this direction which can be really undertaken in New York is to arouse the attention of the people to the prevailing conditions of garbage collection, removal and disposal, and to the absolute necessity for a more cleanly and sanitary method. According to the testimony of the best experts, this putrescible household offal is a most offensive mixture of animal and vegetable matter in a state of decomposition, which, when mixed with other refuse, serves to contaminate the entire heap, producing offensive odors and supplying pabulum for the germs of disease.

"It is this great mass of dangerous matter which must be properly collected and cared for. Under the light of modern sanitation, it should be insisted upon that this portion of public refuse should be collected by itself; that it should be destroyed by the most rapid and thorough process that is possible to put into operation; that it should be done each day, and that there should be no opportunity for putrefaction. Nor should there be any chance for its disposal at a place where it may become a future menace to the health of the public."

Colonel Morse, in closing his address to the Health Association, said:

"We know from experience the effect produced on the minds of people by the five cases of cholera reported in this city last September. It was most alarming, in view of the prevailing sanitary conditions, and readily productive of an epidemic of the dread disease. We do not know whether there will be a similar visitation in the coming spring. But there is every reason to believe, from the history of cholera abroad, and the fact that the communication between Europe and America is so rapid and close, that it will be almost a miracle if we can keep out the germs which are now kept in restraint by the cold weather.

"Taking into account the statements from the best-accepted authorities on the subject, there is every reason to expect that the cholera may again make its appearance, and this time with a much better chance of becoming epidemic throughout the country. It

would seem to be the duty of every one who has the welfare of the city at heart to lend the weight of his influence to the adoption of every method which has been proved to be of value as a means of public-health protection. Certainly the question of the disposal of garbage is one which ought to arouse the attention and interest of every person in the city to the importance of improving the present dangerous way of treating offensive and worthless matters."

The remedy or substitute proposed by Colonel Morse for the present method of garbage-disposal in New York is cremation, or the destruction by fire of the entire refuse of the city, with the exception, of course, of ashes. These latter can still be dumped as now and at comparatively small expense, if not mixed with vegetable or animal matter. Colonel Morse advocates the immediate building of a number of small furnaces or crematories, larger than, but similar, to the one in successful and constant operation at the foot of East Sixteenth Street, to be located in different parts of the city, chiefly along the water-fronts on both sides of the city. Others can be erected in vacant lots,—temporarily, perhaps,—in the upper part of the city.

To these crematories would be hauled, in tightly-closed carts, every hour, by night as well as by day, the refuse product of stables, markets, shambles, factories, shops and the household, there to be utterly destroyed off the face of the earth, including all the noxious gases and odors, leaving nothing but the ashes, fully purified. These ashes, by the way, it is believed, could be made the source of some revenue to the city as fertilizers, to be sold to the market-gardeners of Long Island and New Jersey.

As usual in matters of this kind, Massachusetts has taken the lead among the Northern and Eastern States. The city of Lowell, last fall, immediately after the cholera scare, contracted for the erection of one of the large-size crematories, which was duly built, and put in practical operation about the first of January. A staff correspondent of the New York *Times* made a visit to Lowell on Saturday, and saw the machine in full blast. Like most valuable inventions, it is one of simplicity.

Described briefly, it is an empty chamber with two fire-boxes and a tall chimney. The chamber is for the reception of garbage. One fire, at one end, is for its destruction, and the second fire, at the other end, is for the burning of the smoke, cinders, gases and fumes as they pass out and over in the attempt to go up the chimney-flue.

At the time of the visit the furnace was in full operation, but nothing could be seen issuing from the top of the high chimney save a thin film of white smoke or steam, while not the least odor of any kind was apparent from any side of it.

Considerable opposition was made at first to the location of the crematory at Lowell, it being within a mile-and-a-half of the centre of the city, and in the midst of a number of dwelling-houses; but, as day after day went by with no unpleasant odors or damaging effects to the health of the neighborhood, all opposition was withdrawn.

The crematory is inclosed in a house made of corrugated-iron, 45 feet long by 25 feet wide. It stands about twenty feet from the line of the street, in what appeared to have been a sand-bank. A platform from the street leads directly to the top of the furnace, through the doors of the house when opened, for the reception of teams.

The teams drive upon the platform, back up to the house-doors, and dump their loads upon a chute made of steel plates which slope toward a number of holes in the top of the furnace. One of the holes is large enough to admit the body of a horse, and whatever the nature of the material thrown down, it quickly falls or is raked into the holes, and descends into the maelstrom of flames passing beneath. The holes are ordinarily covered with fire-clay plates, withdrawn and replaced by the aid of iron handles. When the apertures are uncovered there is a strong downward draught, and no odor is apparent upon the premises save that from the material as it is dumped. A hose and brush, however, quickly clean off the platform, and the roaring fire takes care of all the waste, both liquid and solid.

The furnace, or cremator itself, is a rectangular brick structure, 35 feet long, 10 feet wide and 12 feet high, with a stack 30 feet of brick and 60 feet of iron. At each end of the furnace, on a line with the garbage-grates, which are set inside, half-way from the top to the bottom, are the fire-boxes, and at the stack-end are flues into the chimney, closed by heavy fire-clay slabs. The interior walls are lined with heavy fire-clay blocks accurately fitted together, backed on the outside by a heavy brick wall, braced and bonded together with stays, rods and angle-irons.

The furnace being charged, the fires are lighted first at the front and afterward at the rear end. The flames from the first fire pass over and through the mass of garbage piled upon the grates, driving the smoke and gases into and across the second fire, where they are consumed. The flames from the second fire are, by the action of a strong draught, brought back underneath the garbage-grates, intensely heating the mass from below. When liquids are to be destroyed, a part of this heat and flame is directed under the hearth, or pan, and all the contents are quickly evaporated and burned. All the odors, gases and products of combustion are passed through one or the other of the fires, there being no escape except across the fire-boxes.

The ashes as they fall through the garbage-grating are raked out of a range of doors on one side of the furnace below the platform, and from time to time, as required, the garbage is stirred up and distributed over the grates by iron bars thrust through an upper range of stoke-doors. The cost of this crematory was in the neighborhood of $10,000, and the cost of its operation, involving the services of two laborers and the burning of a ton-and-a-half of coal a day, is an additional expense; but the city swill-houses are abolished, along with the system of selling the garbage to farmers with which to feed swine and, perhaps, milch-cows, as has been done, and the city authorities and chief property-owners are satisfied with the change and the extra charges, in view of the results.

Boston is busy experimenting with various kinds of crematories, oil and coal burners, and will probably, according to the report of the health authorities, adopt the cremating system before the warm weather sets in.

In the Southern cities garbage-crematories have become quite numerous, and are still increasing, owing to the greater danger of epidemic diseases in warm climates. The work of a crematory in Savannah, Ga., during eleven months of 1892 gives an interesting idea as to what the garbage of a city of 65,000 inhabitants consists of and of its quantity. During the time mentioned there were burned 15,473 loads of garbage, or 41,271 cubic yards, 611 loads of night-soil, equalling 3,675 cubic yards; 49 cows, 45 horses, 43 goats, 623 dogs, 1,100 cats, 73 barrels of fish, 71 barrels of onions, 38 barrels of apples, 19,607 pounds of meat, 6,742 head of poultry, 8 loads of oranges, 28 loads of bananas, 13 loads of cocoa-nuts, 1 load of apples, 1 load of peaches, 18 loads of peanuts, 18 loads of potatoes, 1 load of tongues, 1,370 dozen eggs, 6 snakes, 1 monkey, 1 rabbit, 1 sheep, and 242 pieces of infected goods. This made a mass of 46,000 cubic yards destroyed, at an average expense of fifteen cents per cubic yard.

Colonel Morse said that to obtain the best results there ought to be one crematory to every 100,000 inhabitants, located as near as possible to such population; but he said that ten or twelve crematories of the larger size would do the work for New York without trouble. They would cost from $10,000 to $12,000 each, making the total equipment of the city amount to something like $125,000—a *bagatelle* by comparison with the results. According to the best reports and estimates, the cost of operation of the cremating system would be about one-third less than the present system of scow-towing and dumping, not to mention the public health and comfort.

There is, it is declared, an offset, more or less important, in the ashes of the burning-system. The process of destruction yields about five per cent of ashes, and between five and eight per cent of the ashes is potash. When screened and separated from broken glass, tin cans, etc., the residue is worth about the same as Canada wood-ashes, or about $24 per ton. In some places the value of the ashes nearly defrays the cost of the fuel. It is believed that crude petroleum, instead of coal, may be used with economical results.

But, as Colonel Morse says, the question is one that ought not to be considered from any other standpoint than the sanitary protection of the public. He declares that it would be for the best interest of the city of New York, in view of the coming cholera menace, to expend the necessary amount of money for the cremation system, if only for one season, regarding it as a temporary expedient if it so pleased. But whatever is done should be done quickly.

The estimated time for the construction of a crematory, ready for operation, is about six weeks, so that, to be ready for warm weather, construction should not be delayed much longer. A beginning, at least, should be made before the middle of March is past.

In beginning the new order of things at the first of the present year the Board of Health of the city of Lowell issued an order, which, in view of the fact that garbage collection and disposal in New York for the past month and more has been anything but regular, might well be copied by the health authorities of this city, regardless of the question of cremation. The following is the order of the Lowell Health Board:

"On and after January 1, 1893, all the swill and garbage made by the householders in the city-limits will be burned, under the direction of the Board of Health.

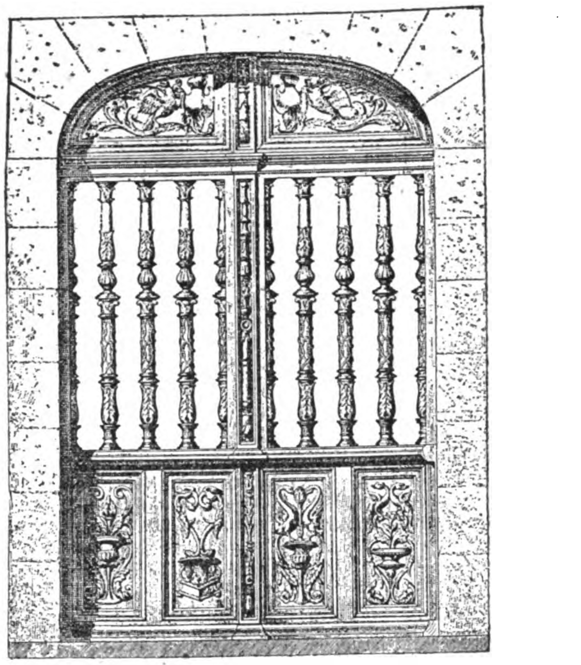
"At present, collections can only be made twice each week, and it is important that it should be kept so as to reduce its possible annoyance during the period of its retention on the premises.

"In order to keep this refuse cleanly, the Board would suggest the making of a box or barrel large enough to keep three days' refuse, and provide it with a cover, that rain-water may be kept out and the odor confined.

"Put in your receptacle for swill all kitchen refuse, apple and potato parings, corn-husks, cabbage-leaves, shoes, rubbers, tin cans, old bedding, soiled linen or cotton, and put nothing but ashes or earth into your ash-barrels."

THE PENN STATUE FOR THE PHILADELPHIA CITY-HALL.—The dimensions of the colossal Penn statue have been amusing the spectators and critics of the City-hall court-yard ever since the snow melted, and the tablet was posted on the now greenish-stained pedestal, down which the bronze ooze has dripped. According to this veracious inventory of the proportions of the thirty-seven-foot 60,000-pound Penn, the modern Gulliver's nose is thirteen inches long, each eye is twelve inches long and four wide, and his mouth stretches fourteen inches from corner to corner. His hair is four feet long, his cuffs three feet and the buttons on his coat six inches in diameter. His finger-nails are three inches long, his feet twenty-two inches wide and five feet four inches long, and his ankle five feet in circumference.—*Philadelphia Record*.

THE NEW GRAFTON GALLERY, LONDON.



XVI Century Door. From Havard's "*Dictionnaire de l'Ameublement et de la Decoration.*"

London is becoming Parisian in the sumptuousness of its picture-galleries, and if the Grafton only had some palms in the corners of the rooms and banks of large-leaved plants in the centre of its settees we might imagine ourselves in the French capital. The rooms are excellently lighted and exquisitely decorated. All the woodwork is white and the walls are hung with dark-red velvet. A flight of steps leads from the handsome entrance down to the octagon-room, the music-room and two long galleries, the latter of which are, unfortunately, too narrow to see the pictures effectively. The architects are Messrs. Wimperis & Arber, who may be heartily congratulated upon the beauty of their work. As to the show, it is somewhat a mixture of the old Grosvenor, the New Gallery and the Paris *Salons;* many of the old names are to be found, and also a sprinkling of new ones. A few very weak and feeble productions are displayed, apparently for no other reason than that they are signed by names of "family,"—that was a fashion held in honor by the promoters of the old Grosvenor; but the majority of the works of the modern New-Impressionist schools seem to suggest that the gallery and the catalogue might have appropriated the celebrated *mot* of Danton: "*De l'audace, et encore de l'audace et toujours de l'audace.*" Some of the foreigners seem to have raked out the veriest—rubbish, I was going to say, but we will designate it as their "slightest impressions"; still it is a pity that powerful painters of great talent should have sent over here what they would not have shown even in the Champ de Mars, apparently *pour se moquer des Anglais.* We all know how foolish the British public is, and how crazy when it gets a craze; we have not forgotten Jumbo and the lady who fed the poor dear with penny buns. Still one would think that even the Britisher would dispute the cleverness of some of these coarse daubs, without any truth of color, with utterly false drawing and no attempt at proper values. Serious work like Raffaëlli's is always welcome, even though we may object to its black coloring and hard outlines; but to call Dannat's pictures art, in any sense but that of throwing dust into our eyes (which, if successful, is really a great art), is surely a monstrous piece of audacity; and the same may be said of J. Morris Henderson's marvellous falsities—a kaleidoscopic jumble of cubes of color forming a species of mosaic.

It is a great treat to see one of Émile Claus's wonderful effects of sunlight here in grimy London. His "*Soleil d'arrière Saison*" is an exquisite example of summer landscape; and note the truth of the blue river against the green, green meadows, and the white cow with tender bluish shadows. "An October Morning" is equally charming, and recalls the artist's work of the 1889 Centenary Exhibition. An Antwerp artist, Franz von Leemputten, is scarcely less original in the treatment of his "Return of a Pilgrimage in Campine." Here is a village crowd, with the priests, the golden-trained image of the Virgin, and banners, waiting the return of the pilgrims arriving in a procession of covered market-carts. There is an aspect of reality in all their backs and the color is bright and crisp. M. Dannat evidently aims at Velasquez in his "Spanish Study" (study!) but falls far short of Goya. Melchers's "Faith" is rather startling to the uninitiated, but his "Wedding" must please even the most hardened Philistine. A young couple stand in church at the foot of the pulpit, from which the black-gowned pastor is haranguing them. The girl's eyes are turned to the ground, the young man gazes upwards, while the family look on from behind. The treatment of the girl's dress and blue-white veil is very masterly, and the expressions of the faces have been well studied by this talented and truthful Scandinavian.

To Londoners Covent Garden is an old friend, but it remained for a Fleming to discover its beauties. Mr. Hoeterickk's "Sands and Paddling" are also very noteworthy. But what in the world does Mr. Alexander Roche mean by making all parts of his "Idyl" of the same tone,—humanity, vegetables and clothes,—a dull leaden yellow? Pleasanter it is to look upon Mr. Orchardson's fine portrait of a somewhat unpicturesque personage—the most masterly performance in the galleries, taking it all round, in color and powerful drawing—and upon M. Fantin's charming flowers. That the fine "Storm Effect" was painted by the Alfred Stevens of old, the painter of *dames du monde,* is hard to believe; as hard as to credit Mr. Stott (of Oldham—do not forget that—*of Oldham*)—as to credit M. Stott with having painted "Iseult." Mr. Stott's faults are not usually weakness, feebleness and sentimentality, but in this picture all these qualities prevail, and the lady seems clad in the properties of the old Newman-street artist academies. Better far are Mr. Stott's landscapes—his sunny pastures and gentle cattle.

M. F. Khnopff is in landscape what M. Boutet de Monvel is in figures. They are strangely flat and low in color, but in effect of light and mist they are singularly beautiful. Very clever also is M. Raffaëlli's "Citoyens"; but every one knows this painter, his merits and his faults; the individuality of his work being his great characteristic, and blackness his chief fault. He uses paint as others do a chalk pencil, and seems to rub in color as a means of tinting "Black and White." Quite opposed to Raffaëlli is Besnard, who has sent his old portrait of the lady flitting across an open window between a play of moon and lamp light. It is vastly clever in color and action; the various lights and reflected lights upon the satin, from the cold pale gray of the moon to the shimmer of the golden lamplight from within the room, are managed in a most masterly fashion; and yet, as a picture, it gives no pleasure; and one wonders at the architecture of the doorway and terrace—it does not seem to explain itself.

Mr. Arthur Melville becomes more and more wonderful and his admission to the Old Water-color Society more and more mysterious. How such a staid society can tolerate him passes one's understanding: he is so utterly wanting in all traditions of respectability and conventionality. His "Sapphire Sea" is marvellous. Taken from a height, we look down upon red roofs, white houses, and a sea which stands upon a heap. People—Indians or Japs?—walk about without legs, but bearing umbrellas, exactly as they appear from the top of the Eiffel Tower. But its very unconventionality is refreshing in the extreme, and, excepting the opacity and heaviness of the water,—the *dryness* of it,—the picture is marvellously true. His "Portrait" likewise is startling in its naked truth; but it is rather the truth of the representations upon a stained-glass window than that of actual life. A girl is sitting with one hand upon the keys of a piano, and the other resting upon a stool; neither has the least pretence to being modelled—there are no knuckles, nor veins, nor nails, only a flat, tinted mass of a certain form. Still the turn of the head and the bold painting of the hideous gown are very clever, if too decidedly *à la Japanaise.*

M. Tattegrain's strange "Entry of Louis XI into Paris, August 14, 1461," is here; and two lovely flower-studies by Fantin-Latour. M. Carrière exhibits what seems to be a study for his large picture of "Maternity" at the Champ de Mars exhibition of last year; and Mr. Albert Moore an elegant little Greekery, "The Toilet." The Saxon painter, F. von Uhde, gives us one of the modern religious pictures, "Lord abide with us"—serious, studied and full of feeling, but unnecessarily ugly and dirty. Our Lord is the mere model who cuts his hair and poses for such pictures, and the laborers who invite him into the house are commonplace and uninteresting. It is by no means a happy example of the school or of the painter. M. Aublet has some good things, and M. Blanche two or three of his peculiar flat portraits; as for Mr. F. Brangwyn and Mrs. Furse, they seem to have red upon the brain.

It is a pity that great artist Roll should be so ill-represented, although there are fine points in his "Portrait of M. Tirard." Kuehl has a delightful interior, Degas his "Absinthe" (was it worth spending time over?) and Mr. C. Pearce a charming mother and child, obviously the Holy Mother and her Divine Infant. "*I have that within which passeth show.*" For beauty of expression and soberness of color this picture could not be surpassed; the beauty of sadness and gentleness, and the pathos of poverty be it understood—not mere prettiness: it has none of that; rather, as regards the child, ugliness, in its little white cap and black hood; but it is the sort of ugliness of some of Henner's types. Some admirable water-colors by Mr. T. Simpson ought not to be passed by without a word.

The exhibition will probably cause the enemy to blaspheme somewhat, and the British Philistine will shout in dismay; but time will settle all things and show who is on our side. Conventionality has had its day, and if Impressionism has done no other good, it has forced people to think. What seemed outrageous twenty years ago is now accepted calmly—Claus, for instance, even Raffaëlli; perhaps we may arrive at putting Dannat and Degas among the masters (when they are a little older), and all the rest of the ballet-girl school *sans cérémonie.* At any rate, such an exhibition as this makes the older amongst us smile, when we think of the scoffing we received some years ago, when Manet's "Fifre" and "Spaniard" were on view somewhere in London, where, I forget, but I well remember

the effect those fine works had upon the mass of the London work. And now go to the Grafton and look at the advanced school! where would poor Manet be, where is even Mr. Whistler, by the side of the younger set of the advanced school? Such is art, and of such are the wiseacres who make up the public. S. BEALE.

BOOKS AND PAPERS

A WEEK or two ago we published a short account of the manner in which a certain corner-stone in Mexico had been subjected to rape, and its contents, unusually valuable, abstracted. It might prove a curious inquiry to seek to discover how and why arose the custom of concealing in the corner-stone of a building contemporary records, current coins and occasionally, seemingly, articles of such value as to encourage a peculiar form of house-breaking. Usually the master of ceremonies is content to inclose with the programme of the dedication ceremonies a few coppers and a copy of a daily newspaper. If the chief or only object of this ceremonial is to preserve for the information of future archæologists a record of contemporary morals and customs, it seems to us that for the daily newspaper, with its record of crime and political squabbles, there might wisely be substituted a good hand-book of the city or town where the building is to stand; and, so far as New York City is concerned, a copy of "*King's New York City*"[1] would be of immense value to those Muscovite delvers who, a few centuries hence, may be working up into new foundations the building-material which now, in another guise, forms one of the city's glories.

This hand-book is a really remarkable and useful publication, encyclopædic in character and volume, full and precise in its statistical information, and, because of its 850 illustrations of important buildings, a book architects will find of real value and use to them, in spite of the fact that, though the buildings have been judiciously selected and carefully illustrated, all mention of their authorship is omitted, save in rare instances. This defect the editors have promised us should be removed in the second edition, which is now in preparation.

THE books are so unquestionably good and useful in themselves that American students of building-construction have long found one of their most useful aids to comprehending the principles and practice of good building to be the three volumes — recently increased to four — of "*Notes on Building Construction.*" In spite of many cases of inapplicability of English methods to American practice, these books have become deservedly popular in this country, and their sale here must have been highly satisfactory to their publishers. Their popularity has been so great that it is rather a wonder that some American publisher has not thought it worth while to pirate them; but we think a pirated edition would be a failure, because purchasers would justly feel that a work of this kind reproduced, however fairly or unfairly, in this country, ought to be edited and revised so as to accord with American practice, and the cost of such revision would wipe out all possibility of a profit. Fortunately, architects, in a certain measure, share the privilege which is enjoyed in its perfection by musicians, who, one and all, can read understandingly all musical compositions, no matter what may have chanced to be the language spoken by the composer. To a very large extent foreign architectural works are comprehendable to all nations, because drawings and diagrams constitute a written language that can be interpreted by the educated eye without having to call to aid the halting tongue and the ill-understanding ear. Because of this, our architectural libraries are full of books prepared in all the civilized lands of the world, and they serve their purpose as fully as if all had been prepared here.

The four volumes we speak of are, however, rather costly, and because they are so largely not adapted to American practice they are passed over by those who can afford to spend money only upon books which are wholly fitted to their daily needs. For such purchasers there has just appeared — although it was not for this class that the book was actually prepared — a little book[2] of two hundred odd small octavo pages, which forms one of "*Longmans' Advanced Science Manuals,*" and is itself styled "*Advanced Building Construction.*" This little work is prepared for the use of those who are fitting themselves to pass the examination for the Advanced Course of Building Construction at South Kensington, and is in reality an abridgement of Parts I and II of "*Notes on Building Construction,*" and forms too useful a book to be overlooked by the American student who cannot afford to purchase the work in its larger and extended form.

THE friends of the late French architect Adrien Joigny have secured for their departed friend and *confrère* not only posthumous honor, but have rendered a service to the literature of architecture which demands acknowledgment. M. Joigny was one of the many accomplished and learned architects who have lent their aid to M. Planat in producing, in a marvellously short space of time, that truly remarkable and monumental work, the "*Encyclopédie de l'Architecture et de la Construction,*" with whose character and scope our readers are already familiar. As was to be expected of the many writers employed on this great work, some have done their work well, some have done it indifferently: some have been content to recast the statements of earlier investigators into new form and changed wordings, but without adding any new quality of statement or lately discovered fact, as is the manner of hack writers; some, on the other hand, have put conscience into their work, have conducted original researches, or at least have personally verified the conclusions of earlier writers. In many cases the men who have done such work as this have not done it exactly at the request of M. Planat, but, having undertaken the investigation of their own motion and followed it up from personal interest in the subject, have afterwards been induced by M. Planat to incorporate the results of their researches in his "*Encyclopédie.*" One curious effect has resulted from this: it was desirable, and in fact necessary, that the alphabetical arrangement should be adhered to, and consequently the work of the same writer, which in reality dealt with an entire group of subjects which were really closely related and which if brought together in book-form would mutually aid and explain one another, are found to be distributed by the alphabetical exigencies through different *fascicules* and volumes, which makes it certain that the pages which treat of them will never be read consecutively, or the subjects encountered in their chronological order. To this second class of writers belonged M. Joigny, and the topic to which he had devoted years of careful study and painstaking research was that of the Classical Orders of Architecture. But few who encounter in their alphabetical order his treatises on the Astragal, Base, Capital, Column, Cornice, Egyptian Architecture, Frieze, Greek Architecture and so on would realize that they were part and parcel of one scheme of treatment. This they are, however, and fortunately M. Joigny had friends who knew it, and as a testimony to the worth and learning of the deceased architect they have gathered together these disjoined fragments and represented them in book-form, together with the cuts which illustrated and explained them in the "*Encyclopédie,*" and they are now obtainable under the name of "*Histoire des Ordres dans l'Architecture.*"[3]

SOCIETIES

THE SKETCH CLUB OF NEW YORK.

MR. GEO. B. POST gave a very interesting talk before the club at its monthly meeting, held in the club-room, Saturday, March 4. Mr. Post commenced with reminiscences of his early professional life, then related his experience in connection with the World's Fair buildings in Chicago and closed with a few words of advice on points of design. At this meeting the Ackerman Prize, a set of instruments, was awarded H. H. Braun, for a pen-and-ink rendering and design of a carved panel. Emil Ginsburger received second mention. Mr. Henry P. Kirby made the criticism and awarded the prize in this competition. For the Miller Prize competition for an exterior perspective of a country-house from plans given, Mr. S. F. Miller read a criticism written by Mr. Geo. Martin Huss and supplemented it with remarks of his own. The first prize, of $35, was awarded to J. Henry Cook, second prize, of $15, to E. J. Brown. The meeting made favorable resolutions in regard to the anticipated amalgamation with the Architectural League of New York under conditions of retaining certain privileges of self-government. EDGAR A. JOSSELYN,
Recording Secretary.

THE T-SQUARE CLUB OF PHILADELPHIA.

THE regular monthly meeting of the T-square Club was held on Wednesday evening, February 15, at the club-room, 29 N. 13th Street. The programme for the evening was pen-and-ink rendering from a photograph. The photograph selected was one of Ann Hathaway's Cottage. James H. Cook's drawing received first place, Chas. G. Bachman's second, and D. K. Boyd's third. The programme for the next competition was then announced, — a design for an entrance to a large office-building in the Italian Renaissance style. PERCY ASH.

THE ARCHITECTURAL LEAGUE OF NEW YORK.

THE annual meeting and election of the Architectural League of New York was held in the club-rooms, 215 West 57th Street, on Monday evening, March 6th. In the absence of President Sturgis, Vice-president Coffin presided. There was a very large attendance, and much interest was taken in the competition for the prize of one hundred dollars, offered by Messrs. Dominick & Haff, for the best

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[1] "*King's Hand-book of New York City*": An Outline History and Description of the American Metropolis, with over Eight Hundred Illustrations from Photographs made expressly for this work. Planned, edited and published by Moses King, Boston, Mass. 1892. Price, $1.00.

[2] "*Advanced Building Construction*": A Manual for Students, by the author of "*Notes on Building Construction.*" London: Longmans, Green & Co. 1892.

[3] *Histoire des Ordres dans l'Architecture.*" Par Adrien Joigny. Extrait de *L'Encyclopédie de l'Architecture et de la Construction.* Paris: Dujardin et Cie, Editeurs, 1892.

design for a silver loving-cup. The prize was awarded to Mr. E. Calmna, of Montreal, Canada, a non-resident member.

The election resulted as follows:

President, George B. Post, of New York; *Vice-President*, Charles R. Lamb, of New York; *Executive Committee*, Class of '95, Edward Hamilton Bell, of New York; Class of '96, Chas. I. Berg, of New York; Class of '96, Edwin H. Blashfield, of New York; Class of '96, Warren R. Briggs, of Bridgeport, Conn.

WARREN R. BRIGGS,
Treasurer and Acting Secretary.

ILLUSTRATIONS

[*Contributors are requested to send with their drawings full and adequate descriptions of the buildings, including a statement of cost.*]

HOUSE OF GEORGE S. WILLETS, ESQ., CORNER ERIE AND PINE STREETS, CHICAGO, ILL. MR. W. R. EMERSON, ARCHITECT, BOSTON, MASS.

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VILLA AT CHAMPROSAY, FRANCE. M. TROPEY BAILLY, ARCHITECT.

[Photogravure.]

LATERAL FACADE OF THE SAME.

[Photogravure.]

ANGLO-CALIFORNIAN BANK, AUSTIN FRIARS, LONDON, ENG. MR. F. ROBERTS, ARCHITECT.

FOREIGN architects who visit the city express surprise to see so many excellent buildings in out-of-the way places. But as London is not planned like their cities, there is no avoiding the drawback which prevents such a building as Mr. Roberts's from being more generally known.

HAMPSTEAD SYNAGOGUE. MR. DELISSA JOSEPH, F. R. I. B. A., ARCHITECT.

THIS synagogue is situated in Dennington Park Road, West Hampstead, on the site of Laurieston Lodge, and was erected to meet the needs of the many Jewish families residing in that growing district. The building would have been placed in West End Lane but for the need of obtaining an eastward aspect for the ark.

The façade is carried out in red brick and red stone, the small amount of detail being Romanesque in character. The leading feature of the external design is the main tower, which is an uncommon feature in synagogue designs and which is a conspicuous object for a considerable distance. This tower contains, on the ground-floor, the main hall; on either side, in the subsidiary buildings, are the vestibules, which lead to the gallery-staircases, inclosed in small wings constituting the end features of the principal elevation.

The main building is octagonal on plan, and in that respect differs from any other synagogue in London. At the corners of the inner octagon are columns carrying the galleries, which occupy the space between the inner and outer octagons, the columns leading up to a dome of great height. The rake of the gallery is exceptionally steep, in order to give a uniformly good line of sight.

The Continental system of grouping the ark, the reader's platform and the pulpit at one end of the building is here adopted for the first time in London. Behind the ark, obscured by wrought-iron grilles, is the choir. The inside of the building is finished throughout in pure white.

The seating capacity, when all the benches are in position, is 700 sittings. Each seat has a rising flap, with box underneath for prayer-books, and has a hinged book-flap in front. There are seven entrances to the building on the ground-floor, the principal entrances being through two pairs of double swing-doors in lobbies, to prevent draughts. The lighting is effected by a sunburner of 171 lights, and by standards and brackets. The heating is a combined hot-air and hot-water system. An ample system of ventilation is provided.

CHATEAU DE MARTINSBOURG, MAYENCE.

NOTES AND CLIPPINGS

THE FAIR'S LOSS OF ITS JAPANESE CEDAR. — The Japanese dwarf cedar is dead. This famous tree, 300 years old, was sent to the Columbian Fair by the Emperor of Japan, but it was taken from its soil and wrapped in brown paper. When it reached Jackson Park, the Department of Horticulture discovered that it would take heroic measures to restore it to strength and bloom, even if life were not extinct. Hot pipes were laid around and about it, but yesterday the time limit was reached and the famous old tree was declared to be dead wood. This cedar, about three feet in height, and 300 years old, was considered to be probably the best specimen in existence of the celebrated dwarf trees of Japan. For three centuries its growth had been checked and held down by the process known to the clever Japs, until in appearance it was a burlesque, or miniature imitation of a noble and massive cedar-tree. There is much mourning among the Japanese in Jackson Park over the demise of the wonderful tree, but it will be retained in the Horticultural Building and given a place of prominence in the Japanese exhibit. The tree now stands in a large flower-pot and is covered with its foliage, which, however, is plainly dead and almost ready to fall off. The gnarled and rugged trunk and branches seem to tell a sad tale of suppressed vigor and growth, and, now that the ancient tree is dead, it looks more than ever like a dwarf, stunted and blighted, but at the same time a marvellous specimen of what time and patience and close attention to the end desired may accomplish. — *Chicago Inter Ocean.*

PRESENT STATE OF THE LABOR-MARKET IN ENGLAND. — The state of the skilled-labor market in England is indicated by the returns of the different trade-unions for December. Twenty-five of these organizations, with a membership of 336,361, have reported to the Board of Trade for that month, but only twenty-three of them report regularly and furnish figures useful for purposes of comparison. According to these, the proportion of unemployed rose from 8.27 in November to 10.2 in December. Deducting the number of men on strike, the number of unemployed was about 8½ per cent; and this is supposed to indicate pretty accurately the condition of the skilled trades all through the country. This is the worst showing since 1886, when the percentage of unemployed among skilled laborers was 10 per cent. The trades now feeling the pinch most are those connected with the shipbuilding and engineering industries, in which employment is very slack indeed. The clothing trades are also in a bad way. The building trades are in a worse condition than for a long time back, the percentage of those out of work being double what it was a year ago. The printing trade seems to have experienced a slight revival, but, with this slight exception, the effect of the reports is unsatisfactory. — *N. Y. Evening Post.*

THE GATE-POST BALL. — That interesting author, Mr. Baring-Gould, in his "*Strange Survivals*," tells us that the balls so commonly seen on the apices of gables and gate-posts of the seventeenth century may be survivals of the old custom of decorating mansions with the heads of felons who had been executed by order of lords of manors, who exercised capital jurisdiction within their domains. Is it not rather the outcome of the semi-Classic taste of the period? — the ball or globe being a very common ornament, not only in English and foreign Renaissance buildings, but also in furniture. In short, architects have gained much from intelligent criticism; they have learned that the separation of art from work was fatal to development; that the gentleman-artist element was destined to reduce the profession to that of the *costumier;* that the intelligent public hesitated to pay for the services of a professional man if he could only produce a very inconvenient building in the dress of a thirteenth or sixteenth century style, and they have learned also that the interests of the profession are bound up with the conviction that architecture is not a defunct art which gave up the ghost in the sixteenth century, but is capable of development, and can be made coextensive with the requirements of the day. — *Building News.*

RESULTS OF THE ZONE TARIFF ON HUNGARIAN RAILWAYS. — The following are some of the astonishing figures of the third year's result of the zone tariff in Hungary. In order to appreciate fully the enormous increase of the passenger traffic, the following annual returns previous to the introduction of the zone tariff ought to be considered. There were carried in 1884, 6,900,000; in 1885, 7,600,000; in 1886, 7,000,000; in 1887, 6,200,000, and in 1888, 6,100,000, showing an actual falling off in the number of passengers, while the receipts during these five years varied between 9,500,000 and 10,500,000 florins. From August 1, 1889, to July 31, 1890, the number of passengers carried was 16,200,000. In 1890-91 it increased to 19,000,000, and in 1891-2 it reached the enormous figure of 28,300,000, — showing an increase, as compared with 1888-9, of 464 per cent, and in point of receipts (which from 9,705,000 florins in 1888-9 had increased to 18,320,000 florins) an augmentation of a round 100 per cent! Well may it be a matter of

surprise that the statesmen and representatives of other Continental nations have as yet made no efforts to follow Hungary's example. — *American Register.*

THE EIFFEL TOWER AND THE CHURCH OF THE SACRED HEART. — It is now rather late in the day to raise an agitation against the Eiffel Tower and the Church of the Sacred Heart on military grounds; but this is what certain Paris papers are now doing. They say they are reflecting the opinion of military authorities; if so, these authorities must have been strangely apathetic not to have discovered long ago what is now put forward as a new danger. It would seem that both the tower, associated with a name that is not in very good odor at the present time, and the prodigious mass of masonry which has been raised on the height of Montmartre, and to which pilgrims now flock from all parts of France, would, in the event of another investment of Paris, serve to direct the enemy's fire upon the besieged city. This is the argument that is used against the two structures on military grounds, and by virtue of which the Government should, it is said, order their demolition without any compunction either of an artistic or a religious kind. As regards the latter sort of compunction, it may be observed that there is but small chance of its being felt in such a quarter. The demolition of the church at Montmartre, however, would involve any government in very serious difficulties, which need not be explained, the history of the building being very generally known. But the military mind, which is fertile in resource, has perceived that these monuments might be employed in the defence of Paris in such a manner as to compensate — perhaps more than compensate — for the mischief they might bring upon the city. It is said that if a gun of large calibre were raised to the top platform of the Eiffel Tower it could drop shells upon any enemy who could bring batteries to bear on Paris. It is admitted, however, that the position of the gunners would be anything but enviable; for if the tower were put to such a use an enemy would certainly keep up an incessant fire upon it until the iron lace-work could no longer hold together. The adaptation of the Church of the Sacred Heart to the needs of war, horrible as the idea seems to all the Catholics of France in whom there is a remnant of the old piety, nevertheless comes more within the range of possible expedients in time of great public danger. It is declared that the great strength and solidity, as well as the height, of the structure, render its conversion into a fort with casemated walls a matter of no great difficulty. Thus it would not only be a target for shells, but a fortress from which others could be thrown a considerable distance beyond the walls on the northern side of Paris. But either these schemes and hypotheses are not to be taken seriously or the very scientific system of defence carried out since the Franco-German War, and according to which the investment of Paris by another invading army would be rendered impossible by the outer circle of new forts, must be considered less scientific than it has been represented. — *Paris Correspondence St. James Gazette.*

A MARVELLOUS MOSAIC. — The splendid mosaics now produced at Venice continue (writes Sir D. Colnaghi in his latest consular report) to take the first place in the artistic markets of the world. Among the important works recently executed is a large mosaic panel representing Columbus being received by Queen Isabella and King Ferdinand of Spain after his return from America. This panel, measuring about 200 square feet, shows Columbus, when kneeling before the sovereigns, presenting to them the natives of the newly-discovered land and some products of the soil. The persons represented are about thirty-eight in number, many of them of the natural size, formed in three principal groups. In the most important group is Columbus, having at his side the young Crown Prince and the sovereigns, surrounded by the dignitaries of the court, ladies and noblemen, and pages holding the standards. In the middle group, but more to the left, are the native Indians, and near the entrance of the hall other Spanish nobles and the companions of Columbus. The gorgeous and various attires of all the figures, their warlike implements, the splendid stuffs of all sorts and tints, the rich decoration of the hall, the pageantry of the court, the strange tones and costumes of the natives in full contrast with the others, and the various attitudes of all these personages form a whole in perfect harmony with the details of the scene, owing to the excellent distribution of the figures and the perfect fusion of tints. The work is so delicately executed that no one can believe that the panel is not painted until, on touching it, he discovers that it is entirely composed of small enamel cubes, put together without any aid of color or cement, and worked according to the mode of the old Venetian mosaic school. This panel will form the pendant of another representing Columbus landing in America. These mosaic-works are executed for Mr. H. Furber of Chicago, who is now building a palace near the premises of the Exhibition, which it is said will be called Columbus Palace, and will be the largest in America. — *Westminster Gazette.*

ST. MARY'S, OXFORD. — Those who revisit Oxford during the coming summer will be startled to discover that the beautiful spire of the University Church of St. Mary's has been sheathed in a most intricate scaffolding, which buttresses it on all sides from top to bottom. It has been discovered that the pinnacles were not safely constructed, and that their precarious lodgement had long been a real danger, although fortunately only one or two small fragments have actually fallen. Those who crowded the triforium of Westminster Abbey upon the recent occasion of the late poet laureate's public funeral have reason to know that, in spite of iron braces plentifully used, the ancient stonework there is not considered safe, for the authorities not only used wooden screens to prevent any undue strain upon the tapering columns, but also detailed workmen to warn the public from time to time against leaning with any weight against these treacherous bits of half-disintegrated stone. It had not been supposed, however, that the spire of St. Mary's was in any such case, since the architect still lives to whose restoration in the thirties much of the great beauty of the steeple is due. Nevertheless, it now appears that, unexceptionable as that restoration was from an artistic point of view, it was not structurally sound. The effects of a disintegration, due to the peculiar atmosphere of the Thames valley, are only just beginning to be understood in their full bearing upon the conservation of ancient monuments. A thorough investigation is in progress by competent engineers acting on behalf of the University, and meanwhile £800 have been expended upon the scaffolding. A rough estimate of the cost of restoration places it at £9,000, and there is doubt still whether more may not be involved, since two cracks traversing the whole length of the structure to its very foundations have already been discovered. — *N. Y. Evening Post.*

A YUCATAN EXHIBIT AT THE FAIR. — One of the most interesting displays that will be seen at the Fair will be that made within the "Ruined Palace of Mitla" by the Department of Ethnology. Prof. Edward H. Thompson, who has been consul at Merida for eight years, has prepared papier-maché moulds of the ancient sculptures found in the deserted cities of Yucatan, and thirty cases of these moulds have already arrived at the Park. They will be installed as soon as the building is completed. The ruins of Uxmal will be reproduced on an extensive scale, and among them will be a perfect fac-simile of the temple and figure of the god "Kukulkan," or the great feathered serpent. The body of the serpent is wrought in the stonework all around the building, and this will be represented entire. The original materials were principally marble and coarser varieties of limestone, and the work shows that the ancient Yucatecos possessed great skill in mechanical workmanship, though their industrial arts were but poorly developed. One of the finest reproductions by Professor Thompson will be that of an arched gate of the ancient palace of Labra, which was literally chopped out of the jungle. — *Chicago Inter Ocean.*

TRADE SURVEYS

THERE is just enough uncertainty in the financial world to make railroad and general manufacturing interests and promoters of enterprises involving large outlays feel that it is hardly the time to forge ahead. In a comparative sense, everything is satisfactory; conditions are better than a year ago, at least on the surface. Prices have been hammered to their lowest possible level. Production has been restricted because margins are not sufficient. New enterprises are not pushed quite as fast as their promoters would like to have them pushed, because of unsettled conditions. There is a great deal of anxiety in the commercial and manufacturing world. One fear is that a stringency may crop out yet; another is that an advance may take place in values — two antagonistic results. Another is that there may be a general withholding of enterprise and a refusal to place orders for spring and summer; in fact, daily contact with business men, from banking down to shop circles, uncovers the curious fact that to-day there are more uncertainties, apprehensions and anxieties regarding the future of trade and business than there has been for six months. One reason is, the time has come for season orders and contracts and the shaping-up of the year's business. Instead of a rush of business since March 1, correspondence and indications all show an extremely conservative feeling. The conservative utterances of the official head of the new administration are received with approval by manufacturing and financial interests, and they will have no small influence upon business. There is a heavy drain of money to the West in progress, which will probably continue for some weeks to come. Gold exports continue. The great powers of Europe hold over $1,300,000,000 in gold for war purposes, and by their holding of this volume of money constitute themselves an enemy to progress and commercial activity. Our home financial situation — on the surface at least — appears safe and sound, but, as before stated, there are large classes of people who need money, and would borrow if they could on partially-improved real-estate. The numerous money-lending agencies doing business all over the West are now advising their principals that it is, in their opinion, safe to expand loans. If their advice is taken, the Western agricultural interests will be still further assisted. The needs, or, rather, the volume, of money for which high rates of interest could be had in eight or nine of the agricultural States has been variously estimated by the managers of some of these agencies at from seventy-five to one hundred million dollars — good investments. The Western banks are now calling in their Eastern deposits, and the volume is now forty million dollars less than a year ago, according to an official statement made on Monday at New York. The point of the whole matter is that there is a growing suspicion in the minds of the average business men that their plans, if pushed, might be spoiled by stringency in the money-market. Jobbers say that, while the total volume of business is larger than last year, orders are, as a rule, very small. The fact remains that business was never done on such slender margins, and no one can suggest a remedy. Yet there are abundant evidences on all sides of industrial growth. In ten years, the capital in the Southern cotton-manufacturing industry increased from twenty-two million dollars to sixty-one millions, and value of products from twenty-one millions to forty-seven millions. The saw-mill industry has increased in like proportion; the pig-iron industry increased fifty per cent, mining in still greater proportion, and the multitude of smaller industries has expanded beyond the knowledge of figures. The stimulus is as great as ever. In the Northern States, the progress made in three or four years has been in different lines, and most of the expansion has been paid for in cash — a very important fact to note. The main features in the industrial world this week are cautious dealings in iron, coal, lumber and general merchandise. The commercial agencies show a good, healthy trade condition, and collections are easy. Borrowers seem to be making a desperate struggle to lower mortgage indebtedness, rather than increase it. Shop and factory work are abundant, but it is evident that the full volume of orders is not being placed. Why this is the case cannot be explained, unless it be due to a conservative spirit generally. Despite the low prices, very few combinations are being attempted. Experience has shown them to be less beneficial in arresting competition than was anticipated. More confidence, instead of more capital, is needed. If, for any reason, business men should conclude to resort to their old habit of placing orders for forward delivery as far forward as has been their custom in former years, there will be a commotion in trade circles such as has not been seen for three or four years.

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CONTENTS

SUMMARY: —
The Lincoln Street Fire, Boston. — Revising the Brooklyn Building Laws. — The City-hall Matter in New York. — The Effect of Cold on Iron and Steel Construction. — Professor Sedgwick on the Cause and Prevention of Asiatic Cholera. . 161
ARCHITECTURE OF THE LOW COUNTRIES. — II. 163
LETTER FROM LONDON. 166
COMPARATIVE MUNICIPAL BUILDING LAWS. — XXIII. 168
LETTER FROM AUSTRALIA. 169
LETTER FROM CANADA. 169
LATRINES OF THE EAST. 170
THE STEVENS BICYCLE TOUR. 174
SOCIETIES. 174
ILLUSTRATIONS: —
Wissahickon Inn, Wissahickon Heights, Germantown, Pa. — Sketches made during the Stevens Bicycle Tour by Mr. Elmer Grey: Three Sheets. — Theological Seminary, Lancaster, Pa. — House at Hartford, Conn. — Design for a City House. — Bachelor Apartments, Boston, Mass. — Designs for a Cottage, a Toll-house, a Public Library and a Country Church.
Additional: Fontaine d'Amboise, Clermont-Ferrand, France. — Fragment from the Columbia Fountain for the World's Fair, Chicago, Ill. — "Rosecourt," Romford, Eng. — St. Frideswide's Mission-house, Poplar, Eng. — Roman Pillar at Igel. 174
COMMUNICATION: —
Brick-veneered Buildings. 175
NOTES AND CLIPPINGS. 175
TRADE SURVEYS. 176

A TERRIBLE fire occurred last week in Boston, which illustrates more forcibly than ever the absolute necessity for the speedy adoption of the rules for building which fire-engineers, such insurance men as Mr. F. C. Moore, and a few architects who have interested themselves in the subject, have been advocating for years, but without finding willing listeners. As in other recent cases, in Boston, one of the buildings destroyed was believed to be built on the "slow-burning" principle, with heavy girders and thick plank floors, but, under the intense heat developed by the combustion of many hundred cords of pine packing-boxes, boots and shoes, laces, ribbons, hats, fireworks, clothing and similar articles in and around them, they melted away, seeming to burn, if possible, more fiercely than buildings of ordinary construction. It is worthy of notice that an old and experienced architect, Mr. Tinsley, has written several articles to the *Spectator* severely condemning the present fashion of ascribing great powers of resisting fire to the "mill-construction," and predicting that, for city building, such construction will soon be pronounced unsuitable, and will be replaced by the only really fire-resisting materials in use, iron and brick or terra-cotta; and it certainly seems as if his prediction would be fulfilled. However valuable the construction of heavy girders and plank floors may be for factories, where the combustible material present — although the material itself may be very inflammable — is generally small in amount, and where the buildings are usually low, comparatively isolated and inclosed by brick walls, with few openings, it is not considered complete even for factories, without the addition of plastering on wire-lath, and is entirely insufficient for high warehouses, filled from cellar to roof with light goods in wooden cases; and the sooner that fact is recognized the better. We think it is Captain Shaw, of the London Fire Brigade, who is chiefly responsible for the adoption of this fashion of building here. Our mill-engineers, although satisfied, and with good reason, of its value for factories under suitable conditions, have been much less disposed than Captain Shaw to prefer it to iron and brick construction for city buildings, and have, indeed, repeatedly warned architects against putting too much faith in the use of heavy floor-timbers, without corresponding precautions in the other details of construction. Now, we imagine that owners will give up Captain Shaw, and return to iron and masonry, used as American architects know how to use them. That heavy timbers are at least as good as naked cast-iron columns and wrought-iron girders is no longer doubted by any architect; but exposed iron construction is almost obsolete, and that twelve-by-twelve timbers are as fire-resisting as iron columns and girders protected by terra-cotta no architect probably now believes, while in nearly every other respect the unshrinkable, undecaying iron construction is infinitely preferable. The main objection is the cost, but, with iron beams at two cents a pound, the additional expense, for a store of ordinary dimensions, is not very serious; and it must always be remembered that, in mercantile buildings, the value of the structure and its contents should be reckoned together in considering questions of economy in construction. As we have often before observed, the willingness of insurance companies to write policies on combustible stores and their contents for less than the risk is worth has been the chief obstacle to the general adoption of more solid mercantile construction. There are many signs that this willingness on the part of the underwriters to trust to luck to save them from the natural consequences of their business methods is disappearing, and in Boston, at least, a movement to promote incombustible construction by limiting the undivided floor-area in buildings with wood floors of any kind to the maximum of five thousand square feet, which has long been advocated by experts, but rejected by the unanimous voice of the mercantile community, would probably now be zealously assisted by the insurance companies.

THE City of Brooklyn is revising its building laws, under the direction of a committee, of which Mr. F. C. Moore, the president of the Continental Fire Insurance Company, is the efficient chairman. So far, only a few of the proposed changes have been made public, but these seem judicious. One is that party-walls in frame buildings shall be of brick, carried through the roof, and two courses above, and tinned over; while another limits the height of frame buildings to three stories. It seems likely, also, that the area of undivided floor-space in buildings not fireproof will be restricted at least to the New York limit of ten thousand square feet, and perhaps to a smaller limit. It is perfectly well understood by experts that the greatest danger from fire in cities lies in the accumulation of inflammable goods in buildings which have large undivided floor-spaces. Even where the floor-space is restricted by law to ten thousand square feet, as is now the case in New York, it is evident that a mass, say of boots and shoes, packed in pine boxes, a quarter of an acre in area, and six or eight feet high, will produce a conflagration, if it once gets well on fire, which no ordinary building-materials can withstand. We have plenty of materials which will resist any blaze which can occur in a room of two or three thousand square feet area, but to quadruple the mass of combustible matter is to increase many-fold the energy of the fire.

THE three experts, Messrs. Hunt, Le Brun and Ware, selected to advise with the Municipal Building Commission in regard to the proposed New York City-Hall, have advised that, instead of trying to retain the old building, it should be removed, so that the ground which it occupies can be used for the new structure. We suppose that these gentlemen are quite as capable of appreciating the undoubted beauty of the old building as most people, but it seemed from the first utterly impracticable to incorporate it with the new one, and the wisest course is certainly in such cases to avoid sacrificing both buildings to unreflecting sentiment. If the old City-Hall could be utilized somewhere else, perhaps in the annexed district, every one would be pleased to see it reërected; and it seems possible that this may be the case. Meanwhile, with it out of the Park, and the ground cleared, there will be nothing to hamper architects in their efforts to design for the city the noblest municipal building that American architecture can produce, — and that it can do great things in the art of designing buildings no one can now deny. To our mind, the great commercial buildings of New York, Chicago, Boston and other cities, on which our best architects spend most of their time, far surpass, in originality, interest and artistic feeling, any other commercial buildings in the world, and, what is more, they are rapidly improving in these qualities. Hitherto, the architects who can do such splendid work have had little inducement to exert their powers for the public benefit, but, whenever it suits city and State authorities to treat them as

fairly, and pay them as well, as they are treated and paid by their private clients, they will be found ready to undertake public work, and they will certainly succeed.

THE *Spectator* makes the assertion that "Chicago architects are studying with some misgivings the effect of protracted cold weather on the lofty steel buildings in that city," and says that the walls and ceilings of several of them are cracked. It goes on to mention that "some of the beams" in buildings in process of construction "have shortened half-an-inch during the long cold spell," snapping off bolts and doing other damage. Of course, it is not impossible that an iron beam might be so fastened into a building that some bolts would "snap" in very cold weather, but we cannot imagine such an effect from any ordinary mode of construction. The "protraction" of the "cold spell" would be of no consequence, as steel and iron conduct heat so rapidly that they would contract as much in the first five minutes of exposure to a low temperature as they would if the temperature remained at the same point for a month. Moreover, in a building of mixed metal and masonry, a "protracted" cold spell, in which the masonry, which is a slow conductor, would have time to cool off and contract in concert with the iron, is much less injurious than alternations of warm and cold weather, in which the sensitive iron may expand and contract several times before the temperature of the masonry is materially modified. Probably the real reason for such cracks as may have been noticed is to be found, not in such contractions as would take place in a building in process of construction, but in the difference of contraction between the metal in the outer walls, exposed to a very low temperature, and that in the interior structure of buildings completed and occupied, in which the thermometer is, in the rooms, rarely allowed to fall below 60°, while the air outside may be at twenty or thirty degrees below zero. Obviously, the difference of temperature must shorten the exterior verticals, the inner ones remaining unchanged, and even a slight variation would distort the angles formed by the inner and outer verticals with the horizontal members connecting them in a way very likely to produce cracks in rigid masonry, particularly in the upper stories, which would show through the plastering. With the ordinary method of connecting the vertical and horizontal members, no further harm would probably be done, and the cracks in the walls would be likely to close partially on the return of warm weather; but a frame with diagonal bracing, or with gusset-plates in the angles, might possibly be seriously strained.

EVERY one who is interested in the sensible treatment of the invasion of cholera, to which we are almost certain to be subjected this summer, should read Prof. William T. Sedgwick's paper, delivered before the Society of Arts in Boston, on the "Cause and Prevention of Asiatic Cholera." Persons sensitive to grammar will have to brace their nerves a little to ask for the *Technology Quarterly* in which the paper is to be found reported, but, whatever may be thought of the English of the title of this periodical, there is usually no question about that of the articles which it contains, and Professor Sedgwick's paper, particularly, is a model of clear and unaffected writing. Like all modern scientific men, Professor Sedgwick regards it as settled beyond controversy that Asiatic cholera is a violent fermentation of the contents of the intestines, attended with the production of substances which act as poisons upon the nervous system, causing vomiting, cramps and collapse, and often death. This fermentation is produced by a living ferment, the cholera bacillus, as the similar fermentation of typhoid fever is produced by the typhoid-fever bacillus, but the fermentation of cholera is more active and virulent than that attending any other intestinal disease, and is consequently more fatal.

IN order that this fermentation of the intestinal contents may be produced, the cholera bacillus must be introduced into the intestines of the patient; just as, to produce any other sort of fermentation, the specific germ proper for that fermentation must be brought in contact with the material to be fermented. The only way in which the cholera bacillus can practically reach the human intestines is through the mouth, or, possibly, in some cases, through the nose. The communication of the ferment through the skin is impossible; so that contact with a cholera patient is not dangerous if care is taken that germs from the infected intestines are not conveyed to the mouths of healthy persons. This is really the only precaution to be taken, but it must be strictly observed. In changing and washing the clothes of the patient, it is difficult to avoid soiling the fingers, and, where attendants or servants are careless, the same fingers, before being thoroughly washed, are often brought in contact with articles of food, leaving on them particles which, when swallowed by healthy persons, are ready to set up their specific fermentation in their new subjects; and it is obviously very difficult to be sure of the necessary cleanliness, even among people accustomed to the use of soap and water. How strict a watch must be kept, and how unsuspected may be the sources through which the fatal germ is introduced into the system, is strikingly illustrated by the history of an epidemic of typhoid fever, which Professor Sedgwick investigated. In this case, the fever broke out in several families in one of the best and most carefully drained and sewered portions of a city in Massachusetts The manner of living of the families attacked was unexceptionable, the water-supply was good, and was the same for the region attacked as for the uninfected portions of the town, and, for a time, no rational theory was proposed to explain the trouble. The State Board of Health, however, coöperating with the local board, made a careful inquiry, and found that the families in which fever had appeared were supplied with milk by a certain farmer, in whose household there had been cases of typhoid fever. The excreta of the patients had been thrown into a vault, the contents of which were used, later, to fertilize a tobacco-field. On the farm was a well, which served as a part of the water-supply for the establishment. The well was covered with planks, laid, however, with cracks between them. As is common in the country, the cans of milk, before being taken to the city for sale, were lowered into the well, to keep them cool. The cans were not entirely filled with milk, and although they were closed with wooden plugs, the plugs were not tight, for milk ran out when the cans were inverted, and there was evidence that water got in during their sojourn in the well. If the water, therefore, contained fever germs, some of the germs might get into the milk, and the presence of particles of manure on the plank cover of the well showed that the men, in passing between the tobacco-field and the well, had brought on their boots some of the former contents of the vault, with, presumably, a proportion of fever germs, and had left them where they were sure to fall into the well, or to be washed in by the drippings from the buckets and cans. In another typhoid-fever epidemic, investigated by Professor Sedgwick, in which about a thousand persons were attacked, and about one hundred died, the infection was found to have come from a house situated on a brook which flowed into the stream furnishing the water-supply for the cities of Lowell and Lawrence, about two miles above the place at which the supply was taken. In this house there were cases of typhoid fever, and the germs from the patients, thrown on the ground, or passing with washing water into the brook, and thence into the river, it reached the city intake-pipes, and were distributed with fatal effect. With such infinite facilities for dissemination, it is not surprising that the active cholera germs soon produce an immense effect in a filthy and ignorant community, but it does not follow that a more intelligent one may not guard itself against them with tolerable success. "Avoid the contamination of food and fingers," Professor Sedgwick says; and he adds that "It is probably safe to say that if the bowel-discharges of the patients, and the fingers of those who have to deal with cholera patients, are properly disinfected, all danger can be avoided, and the disease confined strictly to its original appearance." The greatest danger for us lies in the contamination of the water-supply of cities. This water-supply must be taken from a large collecting-area, which it is not easy to guard, and, in some cases, there is evidence that it is already contaminated. Philadelphia, Chicago, Lowell, Lawrence and Albany, Professor Sedgwick says, show by their very large annual death-rates from typhoid fever, which, in the case of Philadelphia and Chicago, are more than twice as great as the rate of Hamburg, that their supply of drinking-water is contaminated by intestinal discharges, and if the same sources which now contribute typhoid germs to their water-supply should be placed in a condition to furnish cholera germs instead, as might happen very soon after the introduction of cholera into the country, there would be in those cities, as Professor Sedgwick says, "just cause for alarm."

ARCHITECTURE OF THE LOW COUNTRIES.[1] — II.

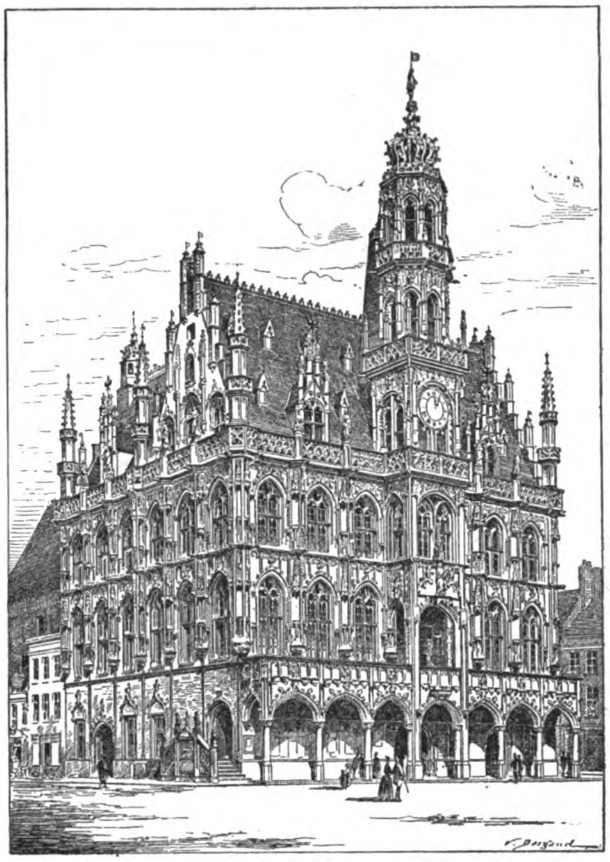


Fig. 4. Hotel de Ville at Oudenaarde.

THE power possessed by the communes, from the thirteenth century, led to the erection all over the Low Countries, and especially in Belgium, of a large number of civil edifices: these include belfries, symbolizing the liberty of the communes, town-halls, emblematic of public rights and municipal dignity, exchanges, representing industry, the chief source of the grandeur and wealth of the commune, and lastly buildings for the accommodation of corporations and trade-guilds, and which bear witness to the spirit of fraternity, association and mutual defence of all the members of the commune. The belfries were sometimes isolated, like that of Tournai, built in the thirteenth century, that of Ghent, erected at the beginning of the fourteenth and that of Furnes. Usually they were connected with the town-halls, as at Brussels (see "Civil and Domestic Architecture," Fig. 13, *American Architect* for Feb. 1, 1890), at Oudenaarde (Fig. 4), at Alost (Fig. 5), at Middelburg (Fig. 6), and at Kampen (Fig. 7), where the bell is housed in a very original fashion. In default of a belfry rising above the town-hall, the bell of the commune was suspended in the tower of the Halles, as at Ypres (Fig. 8), at Bruges (Fig. 9), at Lierre, at Termonde and at Nieuport. Sometimes also the tower of the principal church was made to serve as a belfry; in such cases, the commune had a large share in the construction of this appendage to the religious edifice. This was true of the cathedrals of Antwerp and Mechlin and of the churches of Utrecht and Breda.

It was Baldwin of Constantinople, Count of Flanders, and the Countess Marie, his wife, who, in 1200, laid the cornerstone of the Halles of Ypres, the largest and most imposing thirteenth-century structure on the continent (Fig. 8). The Halles of Bruges (Fig. 9) was erected in 1284 and the belfry in 1291; the wooden spire which once capped it was demolished in 1740. It is 352 feet in height. We may also cite the Halles of Mechlin, of Louvain, Nieuport, Diest, Termonde, Lierre and Ghent. These were all cloth-halls; some cities had also important meat-markets, among which those of Antwerp and Ypres are remarkable. In addition to the town-halls of Alost, Oudenaarde, Louvain (Fig. 10) and Middelburg, of which we give reproductions, there are in Belgium, those of Ghent, Furnes, Mons, Bruges, Brussels, Courtrai, Damme, Léau and Hoogstraeten; in Holland, those of Alkmaar, Gouda, Veere, Kampen and Huisden. The most important guild-houses erected during the Pointed period are the Skipper House at Ghent (Fig. 11) and that of the Guild of

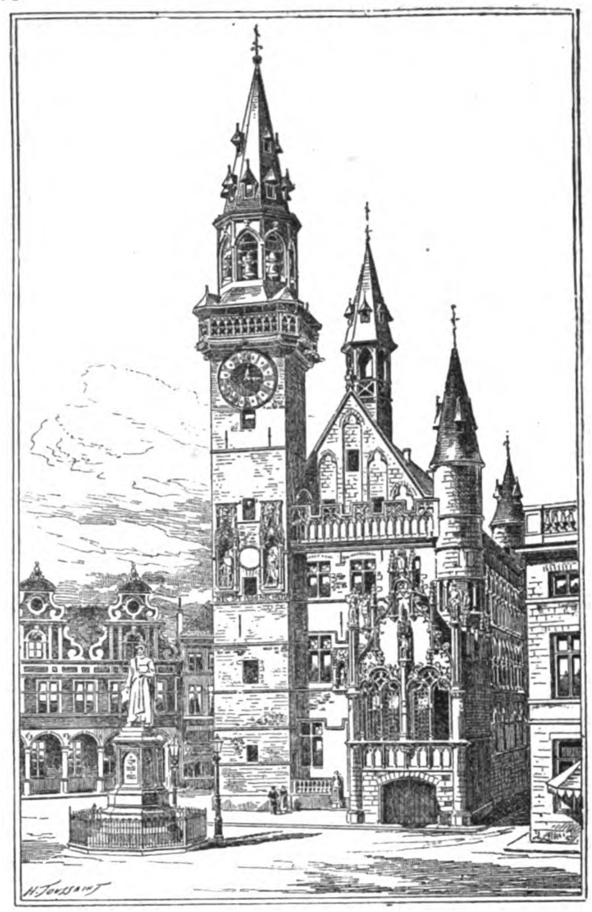


Fig. 5. Town-hall of Alost.

Fishers, on the Quai-au-Sel at Mechlin. Bruges still possesses the picturesque guild-house of the Arquebusiers of St. Sebastian. In this opulent town, one of the greatest marts of the

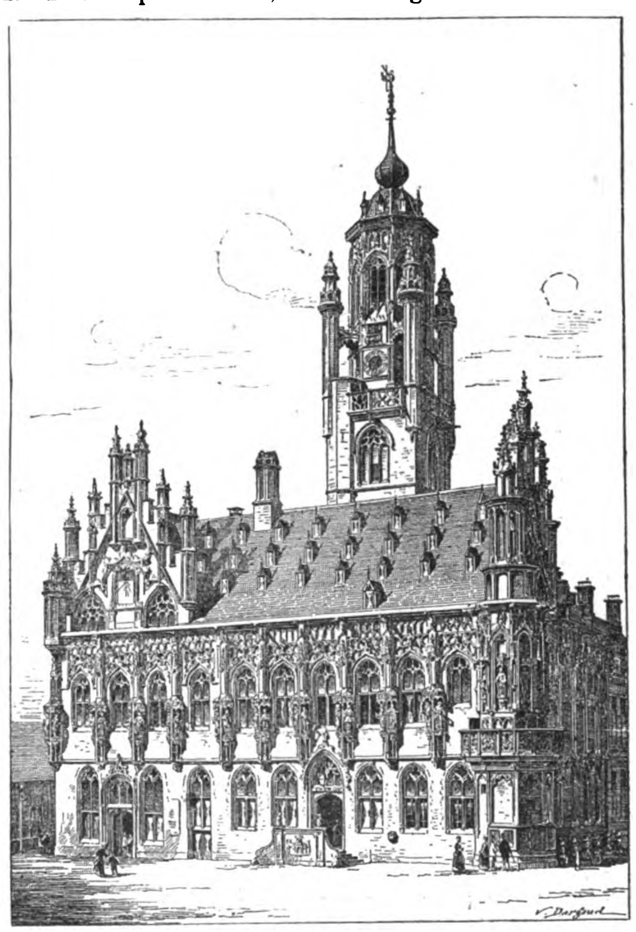


Fig. 6. Town-hall of Middelburg.

Hanseatic cities, companies of merchants from seventeen different kingdoms had their warehouses and residences. The

[1] From the French of J. van Ysendyck, in Planat's *Encyclopédie de l'Architecture et de la Construction.* Continued from No. 898, page 149.

most celebrated were those of the Castilians, the Florentines and the Genoese, which were veritable palaces. Bruges was still, in the fourteenth century, the commercial centre of the continent. Merchants of all nationalities met there in the spacious palace of the Van den Buerse family, whose arms, bearing three purses, were carved above the entrance. Similar establishments were hence termed "*Bourses*." The only Bourse of this period remaining in Belgium is that of Antwerp, which was carried up a story (Vol. II, p. 396) after the fire of 1858, and thus partially lost its primitive characteristics.

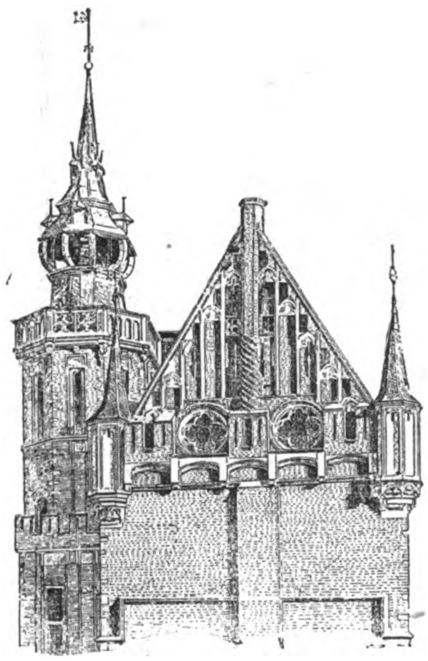


Fig. 7. Town-hall of Kampen.

The restricted limits of our work make it impossible for us even to enumerate all the remarkable constructions that may be seen in the Low Countries, or to pass in review the private dwellings, notably typical examples of which occur at Bruges (Fig. 12, and Fig. 14, Vol. V, p. 561), or to refer to the city-gates, of which Haarlem and Amsterdam preserve such quaint specimens, or, lastly, to call attention to the châteaux and military constructions. The predominant feature in the manifold architectural combinations of the period under discussion is picturesqueness as appears from certain quarters of Bruges (Fig. 13). A fact to be noted, in closing this survey of the works of the Pointed period, is that but slight influence was exerted by the lodges or corporations of masons on the development of art from the thirteenth century to the sixteenth, in the provinces of Belgium and Holland. The Cathedral of Brussels is almost the only structure in which their coöperation appears, and this perhaps accounts for the individual stamp borne by the works of this glorious period, works in which Keldermans, Van Peede, Layens, Du Hamel, Van Ruysbrœck and the entire colony of famous artists, their contemporaries, found a field for the exercise of their originality.

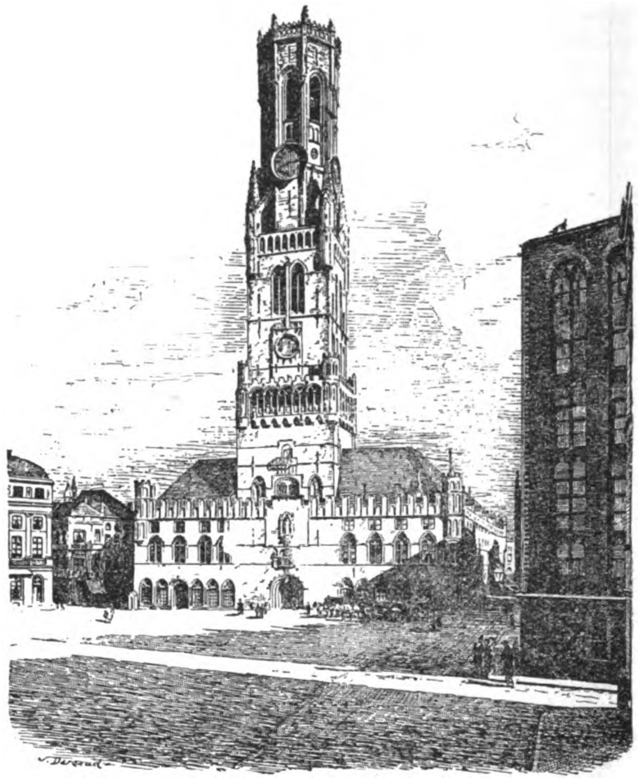


Fig. 9. Halles of Bruges.

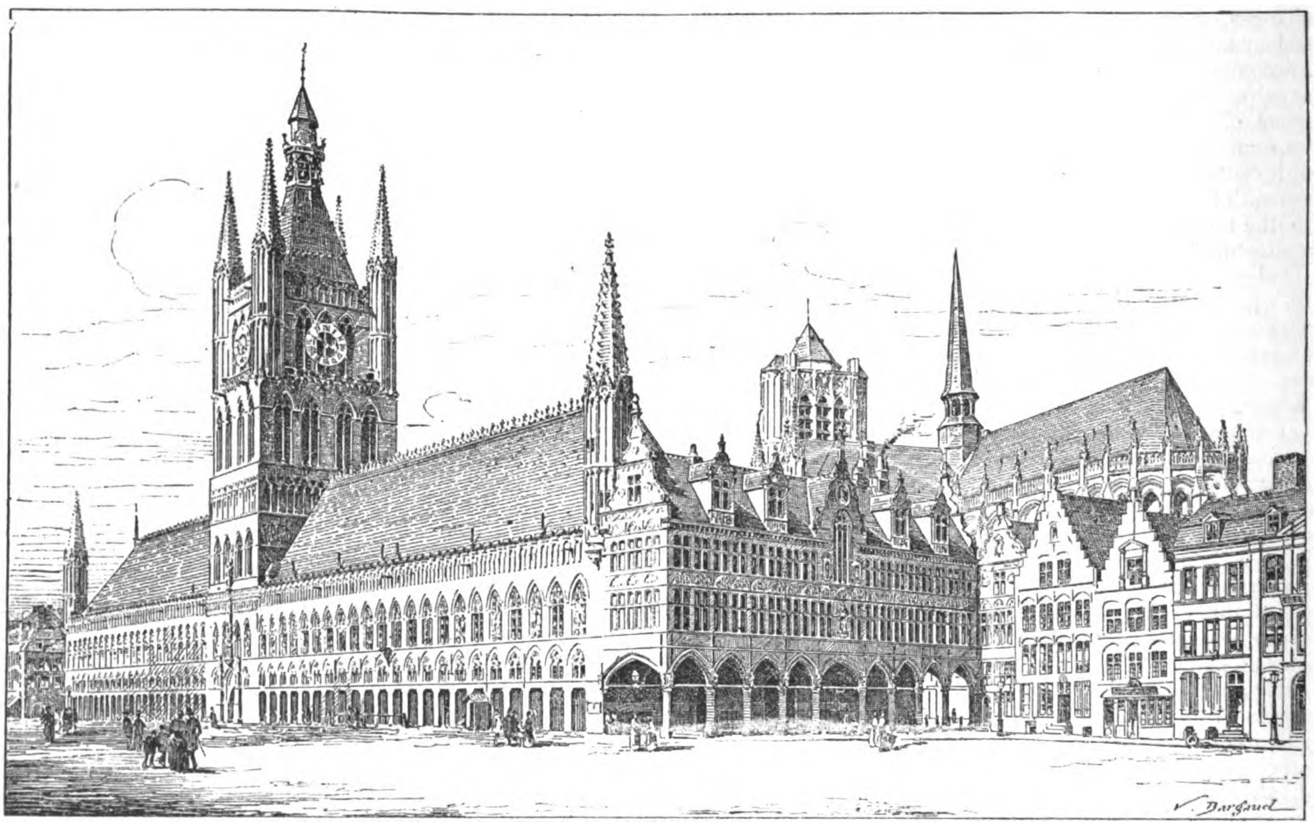


Fig. 8. Halles of Ypres.

THE RENAISSANCE.

The Renaissance style made its appearance in the Low Countries at the same time as in France; it originated there in the same manner, but was slower in making its way. It was foreign artists that erected at Bruges, in 1495, the consular building of the Biscayans, the first Belgian structure to bear

the stamp of the Renaissance. Soon after, Lancelot Blondeel, a painter and architect of Bruges, author of the great triptych painted for the Guild of Barber-Surgeons, designed the famous chimney-piece of the old town-hall of the Franc de Bruges [see "Fireplaces," Fig. 10, *American Architect* for May 28, 1892]; Guyot de Beaugrant executed the five beautiful statues with which it is adorned, at the same time that he sculptured those on the tomb of Ferry le Gros, in the church of Saint-Jacques, at Bruges, and the small figures on the rich rood-loft of Tessenderloo. The magnificent decoration, which gives this chimney-piece a place among artistic productions of the first order, is the work of Royer de Smet, Herman Glosencamp, Jacques Crepeu and Adrien Rasch. It was probably intended to be in polychrome and gilded. In the centre of the composition is a statue representing Charles V; he stands before a throne, wearing his crown and clad in armor, with the imperial mantle thrown over his shoulders, the collar of the Order of the Golden Fleece about his neck, a sword in his right hand and a globe in his left; above the throne is the escutcheon of the Empire; five armorial bearings of the countries ruled by the sceptre of Charles V are borne on either side by powerful columns and

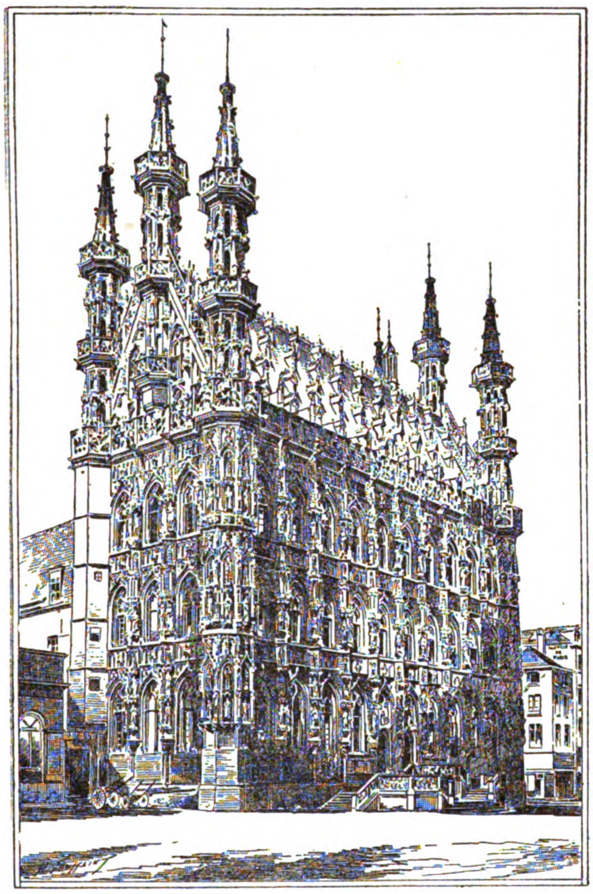


Fig. 10. Town-Hall at Louvain.

held up by genii; along the edge are the sixteen escutcheons of the paternal and maternal ancestors of the emperor; at the angles, above the mantel and bearing the supports of the ceiling are genii holding aloft sculptured medallions; the bust of Francis I and of Eleanor of Austria and the portraits of Philippe le Bel and Jeanne la Folle are reproduced above the throne; on the back are those of Charles de Launoy and Margaret of Austria. The two figures in the panel on the right represent Ferdinand of Aragon and Isabella of Castile; on the left are the statues of Maximilian and Marie de Bourgogne. This masterly work was executed between 1529 and 1531.

East of the present town-hall, and on a line with it, is the old municipal record-office, erected in 1534, after the plans of Jean Wallot. It is a noteworthy construction, richly sculptured on the exterior; of the three gables of the façade, the central and most important bears the statue of Justice; that on the left is adorned with figures representing Moses, Fidelity and Prudence; on the right, is Aaron, with Force and Temperance. Aside from purely decorative medallions, we find also the armorial bearings of Charles V, of the countship of Flanders, of the city of Bruges and of the principal guilds of the commune. Bruges, as numerous private edifices still bear witness, was the first Netherlandish city to adopt the Renaissance style; it was from this art-centre that the new style made its way into other towns, and the movement was propagated there, quite naturally, by reason of their size, their wealth and

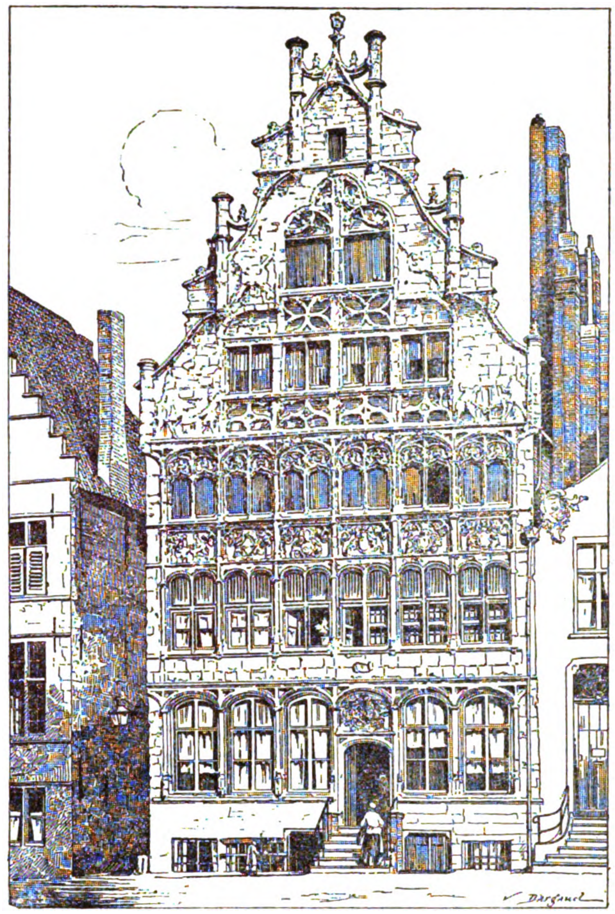


Fig. 11. Skipper House at Ghent.

their artistic aspirations. Nevertheless the impetus acquired during the Middle Ages, under which the territory of the Low Countries was bestrewn with important and remarkable structures, diminished in force in the sixteenth century, during years of civil disturbances, and with a terrible religious war in progress which extended its ravages even to the remotest parts of the country. The iconoclasts carried their mania for destruction into the whole realm of architecture, but it was especially active against houses of worship. Then art gradually made its reappearance in the building world, but only until the close of the seventeenth century, when the wars of Louis XIV again interfered with the progress of the movement.

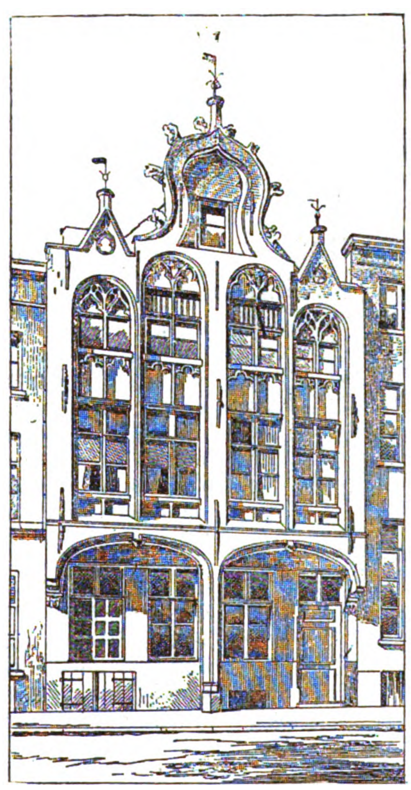


Fig. 12. House at Bruges.

Antwerp, in the sixteenth century, came so completely under the sway of the Italian Renaissance that it soon became the centre of a great school, whose principal artists were trained in Italy. It is interesting, however, to see, in examining their works, that the masters of the sixteenth and seventeenth centuries were not only able to assimilate most completely the artistic principles of the Italian school, but that, at

the same time, they could draw from these foreign sources and still preserve to their constructions the characteristics peculiar to Flemish architecture — ampleness of form and perfection in the management of light and shade. To obtain the picturesque effect for which their compositions are generally distinguished,

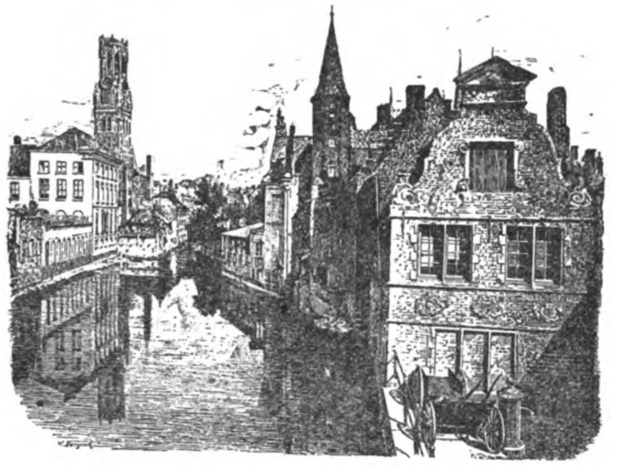


Fig. 13. Picturesque View of Bruges.

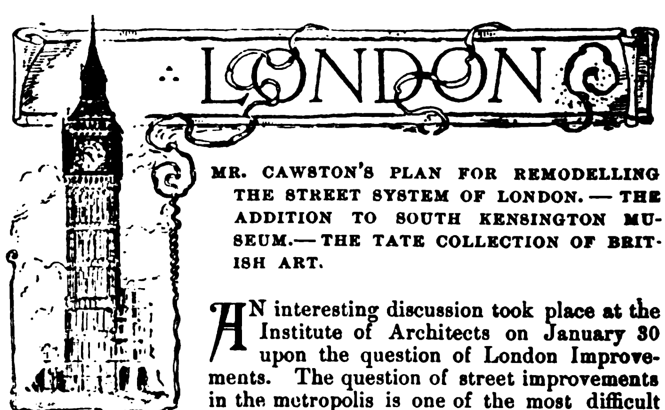
they took advantage especially of the color of their materials, at the same time that they gave heed to climatic and utilitarian demands. The Netherlandish masters of the sixteenth and seventeenth centuries being for the most part painters, architects and sculptors, were the impersonation of the art of the time, and that so many original Renaissance productions have been left here is due to their preëminently complete training.

Peter Cœcke, of Alost, painter and architect to Charles V, was one of the first to visit Rome; on his return he immediately published a Flemish translation of Vitruvius and of the architectural works of Serlio. These had a wide circulation and a powerful influence in the Low Countries. This time, Italian art popularized was destined to form a basis for all the new combinations. Peter Cœcke hastened to put the latter in practice on the entrance of the *infante* Philip into Antwerp in 1549. He designed in the new style the numerous triumphal arches erected for the occasion and the decorations which he was charged to execute. So successful was he that he was invited to take the direction of a great many edifices, among which was the sumptuous residence of Thierry de Mœlener at Antwerp. Its beautiful decorations are still preserved; one of the monumental fireplaces has been reconstructed in an apartment of the town-hall at Antwerp.

Fig. 14. Town-hall at Antwerp.

Cornelis de Vriendt, called Floris, comes next in the long list of artists whom a sojourn in Italy initiated into the mysteries of Renaissance principles. In the erection of the town-hall at Antwerp in 1564 (Fig. 14), which work he directed, he showed clearly that, notwithstanding his rare powers of assimilation, he could maintain his originality and his nationality. Architect and sculptor at once, he himself executed most of its magnificent carvings; it is an isolated, imposing monument, with four façades of the same disposition forming the sides of a vast parallelogram; the basement is of red marble, as well as the columns of the projecting portion. The beautiful chimney-piece in the Salle des Mariages is one of the most successful of the master's sculptural achievements. Cornelis de Vriendt was also the architect and sculptor of the rood-loft separating the choir and nave in the Cathedral of Tournai; it was erected in 1566, and is a sort of triumphal arch resting on Doric columns of red marble with alabaster capitals; this order supports a small attic of ten Corinthian pilasters, framing-in fine alabaster bas-reliefs. This splendid work marks the first stage in the introduction of Renaissance furniture into the edifices of the Middle Ages. To the same master is due the tabernacle in the northern transept of the Church of St. Leonhard at Léau, one of the most remarkable productions of the Belgian Renaissance. It is fifty-two feet high, and has a large number of statuettes borne on brackets of the most delicate workmanship. This profusion of ornamentation is distributed over several stories of colonnettes; the whole is surrounded by a brass balustrade embellished with small figures; it was executed in 1552. The renown of this eminent artist extended to foreign countries, for which he furnished numerous objects of art. In Norway, the tombs of several sovereigns are from his chisel.

[To be continued.]



MR. CAWSTON'S PLAN FOR REMODELLING THE STREET SYSTEM OF LONDON. — THE ADDITION TO SOUTH KENSINGTON MUSEUM.— THE TATE COLLECTION OF BRITISH ART.

AN interesting discussion took place at the Institute of Architects on January 30 upon the question of London Improvements. The question of street improvements in the metropolis is one of the most difficult problems with which Londoners have to deal, and so many questions of a financial and social character are involved that a thorough discussion of the question is by no means an easy task. The condition of London streets is probably as well known to the American as to the Englishman himself. It is a vast uncontrolled growth of Mediævalism. The streets are for the most part narrow and tortuous. They are laid out on no settled plan and are very bewildering to the stranger. When, however, we consider the history of London and the promiscuous nature of its growth, it is difficult to see how it could very well have been otherwise. To-day, however, we are being confronted with the necessities of nineteenth-century rapidity of living. The sedan-chair has given place to the omnibus, and both vehicular and pedestrian traffic have increased to a very considerable extent, so much so that our main thoroughfares are becoming insufferably narrow, with the result that frequent blocks ensue, entailing the sacrifice of much valuable time. On the other hand, while our streets, as a general rule, go on from century to century of the same width, the buildings fronting them are continually being demolished and being replaced by blocks of offices and stores many stories higher than those previously existing. This is a state of affairs that would be annoying in any town of importance, but in a place of the political and commercial status of London the need for amendment is generally admitted, and the only question is as to how it is to be carried out. Therefore it is not to be wondered at that a considerable number of architects assembled at the Institute when it was announced that Mr. Arthur Cawston proposed to read a paper upon the advantages of adopting a general scheme in making improvements to the London streets. The idea of a comprehensive plan has been floating in men's minds for years, but the practical difficulties have been felt to be insurmountable. If the present generation were inclined to spend vast sums of money for improvements that would only be seen and enjoyed by their children and grandchildren something might perhaps be done, but that is not a characteristic of the London rate-payer of to-day. Suppose, for example, a general plan could be set out which met with universal approval, — a difficult matter, to start with, — and all the houses in the line of the proposed new streets condemned, the state of London during the period of change would be not far removed from chaos. A plan, to be of any good at all, must not only take account of the needs of to-day, which are great enough, but must endeavor to grasp the probable condition of London two hundred years hence and make allowance for it. If it did not, the improvements, after all, would not be a complete solution of the problem. It seems to me, moreover, that Mr. Cawston argued on a wrong basis. He began, for example, by quoting a powerful description by Mr. Albert Shaw of the recent improvements of Paris. "In the work,"

writes Mr. Shaw, "of transforming the labyrinthine tangle of narrow, dark and foul Mediæval alleys into broad modern thoroughfares, and of providing those appointments and conveniences that distinguish the well-ordered city of our day from the old-time cities, which had grown up formless and organless by centuries of accretion — in this brilliant nineteenth-century task of reconstructing cities in their physical characters, dealing with them as organic entities, and endeavoring to give such form to the visible body as will accommodate the expanding life within, Paris has been the unrivalled leader. Berlin and Vienna have accomplished magnificent results in city-making, and great British towns — Glasgow, Birmingham, Manchester and others — have, in a less ambitious way, wrought no less useful reforms, but Paris was the pioneer. French public authorities, architects and engineers were the first to conceive effectually the ideas of symmetry and spaciousness, of order and convenience, of wholesomeness and cleanliness in the urban arrangements."

Now this may be all very well for cities which mainly consist of "labyrinthine tangles of narrow, dark and foul Mediæval alleys," but London, at all events in its central districts, consists of nothing of the sort. We have some slums in the central districts, it is true, but they are not of great extent and are mostly in such situations as would render it difficult to use their sites more advantageously, and where they do exist there are any number of large manufactories scattered about amongst them which would render any serious removal a matter of enormous expense. Take, for example, the proposed new "Council Broadway," which stretches from the Strand to Holborn through a district which might be justly cited as one of the lowest of the central London districts. The cost of its construction is estimated at nearly three million dollars.

With these difficulties in our minds, let us consider briefly Mr. Cawston's proposal. The reasons he adduced for having a complete comprehensive plan were five in number:

1. For discovering the causes of our present inconveniences.
2. For producing the best improvements that can be produced.
3. For forwarding them as rapidly as possible.
4. For making them as economically as possible.
5. For æsthetic reasons.

Directly he began his consideration of the first head, he was confronted with the great barrier running transversely across central London from Theobald's Road to the Thames embankment, in the shape of the lawyers' properties. These, known as Gray's Inn, Lincoln's Inn, Furnival's Inn and the Outer, Inner and Middle Temples, are sacred properties. They have belonged for hundreds of years to certain societies of barristers, and possess certain royal charters which are most jealously preserved and whose inviolability would be defended to the uttermost by perhaps the most influential body of men in England. Mr. Cawston was driven, as any one else in his position would have been, to propose cutting through these estates, though how it was to be done he did not suggest. Other impediments he discovered in railway viaducts and embankments, in public parks and gardens and in the river.

The next question he touched upon was the rehousing of the displaced working population. He admitted the necessity of placing these close to their work, but deemed it scarcely consistent with the general welfare to give up the very central square mile of London for the purpose. The solution he proposed for this difficulty was to remove certain institutions, as the Foundling Hospital, the Military School at Chelsea, Bethlehem and St. Luke's Lunatic Asylums and many gas-works and water-filtering beds, into the country, and to occupy their sites with laborers' dwellings. There were fifteen sites which he proposed should be gradually devoted to this purpose, and if this were done he estimated that 127,000 of the working-class could be accommodated within one mile of the centre of the metropolis. He then explained the principle upon which he felt that a new plan should be based. The streets should be continuous arteries, sufficiently wide for the future as well as for to-day, and judiciously placed so as to connect the most important centres of business and habitation and the railway termini. Immediately a comprehensive plan was studied the small number of our main streets and the shortness of our other streets became at once manifest, and their length and uniformity were only to be obtained by planning streets to a small scale for the whole county.

Mr. Cawston then passed to the methods he proposed to adopt in order to carry out his proposals. He did not explicitly define the mode of procedure he considered the best, but left us to infer it from the nature of his remarks. "If a comprehensive plan were authoritatively adopted in London," he said, "no single building in the whole county could be rebuilt without reference to the revised lines of frontage as laid down on that plan, or without becoming an integrant part of the grand city that it would be the ultimate object of the plan to produce." The annual average of buildings built or rebuilt in London during the past three years has been 21,932. Of these he felt that one-fourth would be affected by proposed improvements, and therefore he considered that there would be 5,000 annual "opportunities for improvement."

"Automatic opportunities," he preferred to term them, because he felt that every opportunity would come without legal expenses or delay connected with compensation for disturbance. This is rather a remarkable argument. It occurs to me that if an owner were aware that his house or warehouse came within the lines of an improvement he would hesitate to demolish it, if by so doing he gave the local authority power to acquire it at the value of the land. Surely the ordinary owner would prefer to maintain it in its existing condition, and so compel the local authority to purchase it at or above its market-value. This being the case, it is hard to see where the benefits of an "automatic" improvement come in. It is apparently no advance upon the ordinary system of compensation under what is known as the "Lands Clauses Act," which is known to be a terribly expensive method, so much so that any comprehensive scheme would at once be placed out of court on the score of expense alone. Mr. Cawston instanced other ways in which he thought economy would be served by a comprehensive scheme, but his arguments appeared to me fallacious, and he finally concluded his paper without any really practical proposal for carrying out his scheme. Indeed, much as I regret to have to say it, I do not think there is any method by which London could be effectually improved on a comprehensive basis so long as the existing law remains. The cases of the foreign cities referred to by Mr. Cawston are not by any means of a parallel character. Paris and Vienna had sources of income denied to London and the initial circumstances were altogether different. All we can hope to do is to carry out isolated improvements here and there as circumstances seem to warrant, and to carry out each improvement as well as we can. The constantly increasing traffic is a source of continual trouble, and the attention of the governing authority of London is incessantly being drawn towards certain narrow necks in existing main streets which cannot very well be neglected. I do not think the street from Holborn to the Strand would have had much chance of being constructed were it not for the fact that the block of houses between the two Strand churches rendered a widening of that thoroughfare an absolute necessity and so the whole matter was dealt with at one time. Even this improvement is as yet only in its earliest stages and some changes in the law of considerable importance will have to take place before the Council can undertake it.

The completion of South Kensington Museum appears to be approaching the state of muddle which seems inseparable from all Government undertakings in this country. It will be remembered that in the limited competition that was held, Mr. Aston Webb was the successful competitor, and it was generally understood that the work would be put in hand at once. Official delays, however, began to take place and before anything was done the general election was held, with the result that Mr. Plunket was replaced at the Office of Works by Mr. Shaw Lefevre, a gentleman of original views on architecture. A rumor appeared in the *Times* that the Government did not intend to proceed with the permanent buildings for the Museum. This the *Builder* contradicts, being "informed on good authority that there is not the slightest ground for the fear that the new buildings will be abandoned." We accept this, of course, but rumor will not be silent, and there are now advocates springing up who assert that, after all, Mr. Aston Webb will not be the architect but that Major Scott's original design will be carried out. Probably before much is done there will be another change of government. (Since I wrote this the Government have announced that there is every intention of employing Mr. Aston Webb as architect, but that the buildings will not be proceeded with this year.)

The Liberal Government, however, may be credited with having secured Mr. Tate's collection of British Art for the nation. You will probably remember my references from time to time on this subject. The original difficulty arose about a site. The Government of the day could not and would not place at Mr. Tate's disposal a site which he deemed adequate for the erection of his proposed gallery and so after considerable wrangling Mr. Tate withdrew his offer. When Sir William Harcourt came into office he attempted to renew the negotiation offering to Mr. Tate for his gallery the frontage to the river now occupied by Millbank Prison. The site did not seem an altogether desirable one. It is situated on an unfrequented part of the Thames embankment, and there are no important buildings in the immediate locality. The County Council are, however, proposing to rebuild Vauxhall Bridge which is in the immediate locality of the prison, and perhaps the two works may reach on each other and alter the character of that particular district. The demolition of Millbank is proceeding apace. It has been divided into sections, which are being let to house-breakers at intervals of about a month for the purpose of giving work to the unemployed. It will not be long before the whole prison is demolished, and the Government will then have to consider what is to be done with the remainder of the site. There is some talk of erecting barracks in lieu of those behind the National Gallery and so permitting its much-needed extension; and I hear that a further portion is to be offered to the London County Council for the erection of laborer's dwellings.

CONCERNING water-backs of kitchen and laundry ranges, it would seem to be reasonable, in view of their liability to being frozen solid in winter, either owing to exposure or when the dwelling is vacant, that some mechanism be introduced in connection therewith. We suggest the following: Cast a boss on the bottom of the water-back and top it for three-quarter-inch pipe and brass coupling, and from it continue a three-quarter-inch brass or iron pipe and join it to the nearest waste-pipe. Place a stop-cock or globe valve on this pipe as close to the range as possible, and easy of access. Manufacturers of kitchen and laundry ranges ought to make this improvement. — *Fire and Water.*

COMPARATIVE MUNICIPAL BUILDING LAWS.—XXIII.

[*Note:*—In these tables bracketed letters invariably refer to preceding passages in the same column.]

Fireproof Shutters.

Boston:—*a. First and Second Class Buildings:* Openings or doorways in party or partition walls required by this act shall not exceed two on each floor, nor combined area on each floor exceed 100 square feet. Each opening to be provided with two sets of metal-covered doors, separated by thickness of wall, hung to rabbetted iron frames, or to iron hinges in brick or iron rabbets, *provided* this section does not apply to theatres.

b. First and Second Class Buildings more than one story high, containing above first story any room of over 600 square feet area, used for any purpose except domestic cooking, of greater fire-risk than offices, counting-rooms and dwelling-rooms, shall have outside openings protected by shutters. Such shutters covered on both sides with tin, or made of other substantial fire-resisting material; hung on outside if practicable, otherwise on inside either upon independent iron frame or upon iron hinges rabbetted to masonry and made to be handled from outside. These requirements apply only to openings in such buildings when openings are above and within 30′ of openings in wall opposite, or the outside face of which diverges at an angle of less than 135° from outside face of wall containing opening and leaves open space between openings and outside of wall.

Baltimore:—*c. Stores, storehouses, warehouses more than two stories high, or more than 25′ high,* shall have doors or shutters made of fireproof material on every window and entrance when same do not open on street, subject to approval of fire underwriters.

d. When such doors or shutters cannot be put on outside of opening they shall be put on the inside and hung independent of woodwork of window.

Brooklyn:—*e. Every storehouse over 30′ in height to highest part above sidewalk* shall have shutters and doors on every window and entrance on rear above first story made of copper, iron or other fireproof material *f.* approved by Commissioner.

Churches and such other public buildings not required to have metal shutters.

Charleston:—

Chicago:—*g. Stores, storehouses, mills, manufactories more than two stories high* shall have doors, blinds or shutters of fireproof metal on every window and entrance where same do not open upon street, or are within 50′ of an opposite building.

h. When such cannot be put on outside they shall be put on inside and hung upon iron eyes or frames independent of woodwork.

i. Shutters above first story arranged to be from outside.

j. Prismatic lights in iron frames regarded equivalent to iron shutters.

Cincinnati:—*k. Buildings of warehouse class more than two stories high,* and located opposite any other buildings having openings, and not more than 30′ distant, shall have openings in walls provided with doors, blinds or shutters made of or covered with fireproof material.

l. These doors or shutters hung on cast-iron eyes or frames. (*j*).

m. Every opening in party-wall closed by two such fireproof doors as described, hung to cast-iron eyes or frames on opposite sides of jambs of opening.

Cleveland:—(*k*); (*l*); (*j*); (*m*).

Detroit:—

Denver:—*n.* Every opening through party-wall of brick building shall have top, bottom and sides of brick, stone or iron; shall be closed by two sets of wrought-iron or metal-covered doors (separated by thickness of wall) hung to rabbetted iron frame or wooden frame entirely covered with metal, or to iron hinges in brick or stone rabbets; shall not exceed 10′ high or 8′ wide; and any opening other than doorway shall be protected in manner satisfactory to Inspector.

District of Columbia:—*All buildings, except churches and dwellings,* in close proximity to other buildings, shall, when ordered by Inspector, be provided on rear side or sides with iron or other fireproof shutters to all openings, of such construction as may be stipulated, which shutters shall be closed at termination of each day's business.

Kansas City:—*Brick buildings to be used as warehouses, stores, storehouses or manufactories more than 45′* in height shall have doors or shutters made of or covered with fireproof material on every window or entrance which does not open upon street, alley or court more than 20′ wide.

o. When such shutters cannot be put on outside they shall be put on inside, and be hung upon an iron frame independent of woodwork, or to iron hinges in rabbets of masonry.

p. Every such shutter or door to be closed at completion of business each day by occupant having use or control of same.

(*i*). Openings for doors in party-walls shall have top, bottom and sides of stone, brick or iron; shall be closed by two sets of wrought-iron or metal-covered doors (separated by thickness of wall) hung to rabbetted iron frames entirely covered with metal, or to wooden frames or two iron hinges in brick or stone rabbets. Openings other than doors protected in manner satisfactory to Superintendent.

Louisville:—(*g*); (*h*); (*i*).

Memphis;—

Milwaukee:—

Minneapolis:—

Nashville:—*Business houses more than two stories high* whose rear extends to alley or centre of block where numerous buildings are brought into close proximity shall have blinds or shutters of fireproof material on all openings above first story; such blinds made of tongued and grooved lumber, covered on both sides with iron.

Newark:—

New Orleans:—(*e*). Buildings having iron shutters on front of same shall have one or more of them provided with such arrangement for opening same from outside as shall be approved by Chief of Fire Department and City Engineer.

New York:—*Buildings of more than two stories, or above 25′ in height above curb-level, except dwellings, schools and churches,* shall have blinds, doors or shutters of iron or other fire-resisting material approved by Superintendent on every opening above first story, except on front, when the street is more than 30′ wide.

All shutters on front windows above first story arranged to be readily opened from outside by firemen.

Rolling or steel shutters on first floor shall be counterbalanced so that they may be readily opened by firemen.

No building other than dwelling or fireproof building shall have inside iron shutters above first story.

Windows and openings above first story may be exempted from having shutters by Board of Examiners.

Duty of occupants to close shutters at close of business.

Omaha:—*Brick buildings more than two stories high, or above 25′ in height above curb-level, except dwellings, schools and churches,* shall have doors, blinds or shutters made of iron or other fire-resisting material approved by Superintendent on every window or entrance on side or rear walls.

(*m*); (*n*); (*o*); (*p*). All shutters arranged to readily open from outside by firemen.

Philadelphia:—

Pittsburgh:—

Providence:—

St. Louis:—*Brick buildings more than two stories or 30′ in height above curb-level, except dwellings and churches,* shall have doors, blinds or shutters of fireproof metal on every window or opening above first story, except where they look upon streets.

When such shutters, blinds or doors cannot be put outside they shall be put on inside.

(*i*). Duty of occupants to close them at close of day.

San Francisco:—Iron shutters above first story must be left open, and fitted so that firemen can readily close them.

Doors and shutters on first story must be hung on hinges, locks arranged to be easily broken by Fire Department.

All iron doors or shutters on front, sides or rear of building shall be hung to iron frame or securely fastened to wall, and in no case shall all windows and shutters be fastened from inside, but at least one on front, side and rear be fastened with lock as prescribed.

(See "*Openings in Party-walls.*") Such openings to have wrought-iron doors on ache side of wall.

Rain-Water Conductors.

Boston:—*a.* Buildings over 45′ high shall have suitable water-tight metallic leaders, and all buildings shall have leaders sufficient to carry all water to street, gutter, or sewer, and in such manner as not to flow upon sidewalk, or to cause dampness in any wall, yard or area.

b. Rain-water leaders, when connected with soil or drain pipe, shall be properly trapped.

Baltimore:—*c.* Inspector is directed to compel owner or his agent to put proper metallic spouting and gutters on buildings, and keep same in repair, so that gutters shall not leak nor overflow to pavement, and carry water from roof to ground, sewer or gutter, protecting walls and foundations.

d. Awnings not extending over curbstone shall be provided with gutters and down-spouts to carry water to street-gutters.

Brooklyn:—*e.* Wooden gutters of stone or brick buildings shall be lined or covered on upper surface with copper or other fireproof material to be approved by Commissioner. (See "*Cornices.*")

Charleston:—

Chicago:—*f.* Buildings shall be kept provided with proper metallic leaders for conducting water from roof to ground, sewer or street-gutter in such manner as shall protect walls and foundations from damage.

g. In no case shall water be allowed to flow upon sidewalk.

h. But shall be conducted by drain-pipe to street-gutter or sewer.

i. Rain-water leaders must never be used as soil, waste or vent pipes, nor shall any soil, waste or vent pipe be used as a leader.

j. Water-leader within house must be of cast-iron with leaded joints, or of copper with soldered joints. When outside house and connected with house-drain, it must, if of sheet-metal with slip-joints, be trapped beneath ground or just inside wall, the trap being arranged to prevent freezing. When leader opens near window or light-shaft, it must be properly trapped at its base. The joint between a cast-iron leader and roof must be gas and water tight by means of brass ferrule and lead or proper pipe properly connected.

Cincinnati:—*k.* Buildings shall be provided with proper fall-pipes connected with sewer, or to catch-basin connecting with sewer when building abuts on street or alley containing public sewer; otherwise water shall be carried to street-gutter in manner approved by Inspector. (*b*).

Cleveland:—(*k*).

Denver:—*l.* Rain-water shall be so conveyed from roof as not to flow upon adjoining property, nor against any wall so as to endanger it or cause dampness therefrom, and all water conducted from building to street gutter or sewer. (*g*).

Detroit:—All gutters shall be of metal.

District of Columbia:—Buildings shall be kept provided with metallic down-spouts and eave and cornice gutters for conducting water without damage to walls or foundations, so as not to drain upon or damage adjoining property, and by drain-pipe to sewer or to gutter under sidewalk where no sewer exists. (*g*).

Kansas City:—*j.* Brick buildings shall be kept provided with suitable water-tight metallic leaders, and all other buildings with water-tight metallic or wooden leaders conducting water from roof to ground, and thence to street-gutter or sewer. (*g*).

k. Nor drip on ground or cause dampness in wall, yard or area.

Louisville:—

Memphis:—

Milwaukee:—

Minneapolis:—Buildings fronting on street shall be kept provided with proper leaders for conducting water from roof to ground, sewer, street-gutter or dry well in such manner as shall protect walls and foundations from damage. (*g*). No leader shall be constructed except in accordance to law.

Rain-water leaders running down outside of building shall have trap or back-pressure valve before entering sewer, drain or soil pipe.

Rain-water leader within building shall be extra heavy cast-iron soil-pipe, or standard wrought-iron pipe tarred inside and outside.

Connection of rain-water pipe with soil and drain pipes shall be on lower side of highest fixture.

A soil or vent pipe above highest fixture shall not be used as rain-water pipe.

Rain-water pipe running from low roof or low eaves shall have trap or back-pressure valve before entering drain or sewer pipe.

Nashville:—Water-spouts emptying contents on public sidewalk shall be connected with gutter by drain laid beneath surface of sidewalk.

Newark:—

New Orleans:—Gutters on buildings where fireproof roofs are required shall be made of non-combustible material, and firmly secured to building by irons.

Balcony projecting over any part of banquette shall be provided with metal gutter attached to outer edge and leading into metallic down-pipe, leading across banquette into street-gutter. But if balcony is entirely roofed, then such gutter shall be attached to roof.

Gutters shall be kept in such repair that they do not leak or drip on sidewalk.

Gutters across banquette shall be covered and approved by City Engineer, or of proper size of drain-pipe.

New York:—(*f*), (*g*), if there is sewer in street. Pipe shall be below surface of sidewalk.

Omaha:—(*f*); (*g*); (*k*).

Philadelphia:—

Pittsburgh:—

Providence:—Buildings fronting on street shall be provided with proper leaders conducting water from roof to ground. sewer, street-gutter or dry well in such manner as to protect walls and foundations from damage. (*g*).

Tenement and lodging houses, water shall not drip from roof so as to cause dampness in walls, yard or area.

St. Louis:—All buildings shall be provided with proper metallic leaders conducting water from roof to ground, river or street-gutter in such manner as to protect walls and foundations from damage.

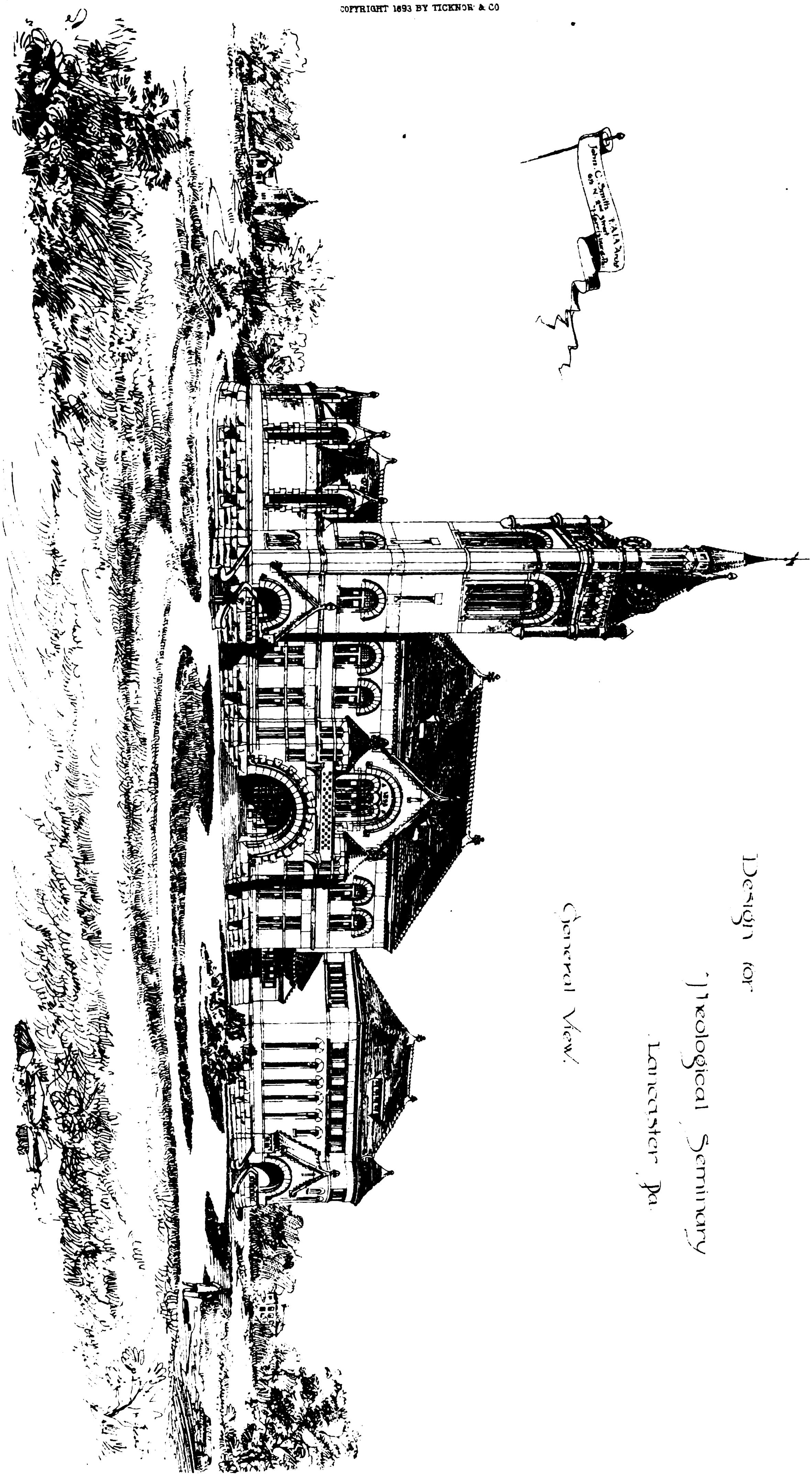
(*g*), but shall be conducted by drain-pipe to street-gutter or sewer.[1]

San Francisco:—Gutters on brick buildings reconstructed shall be made of fireproof material.

Wilmington:—

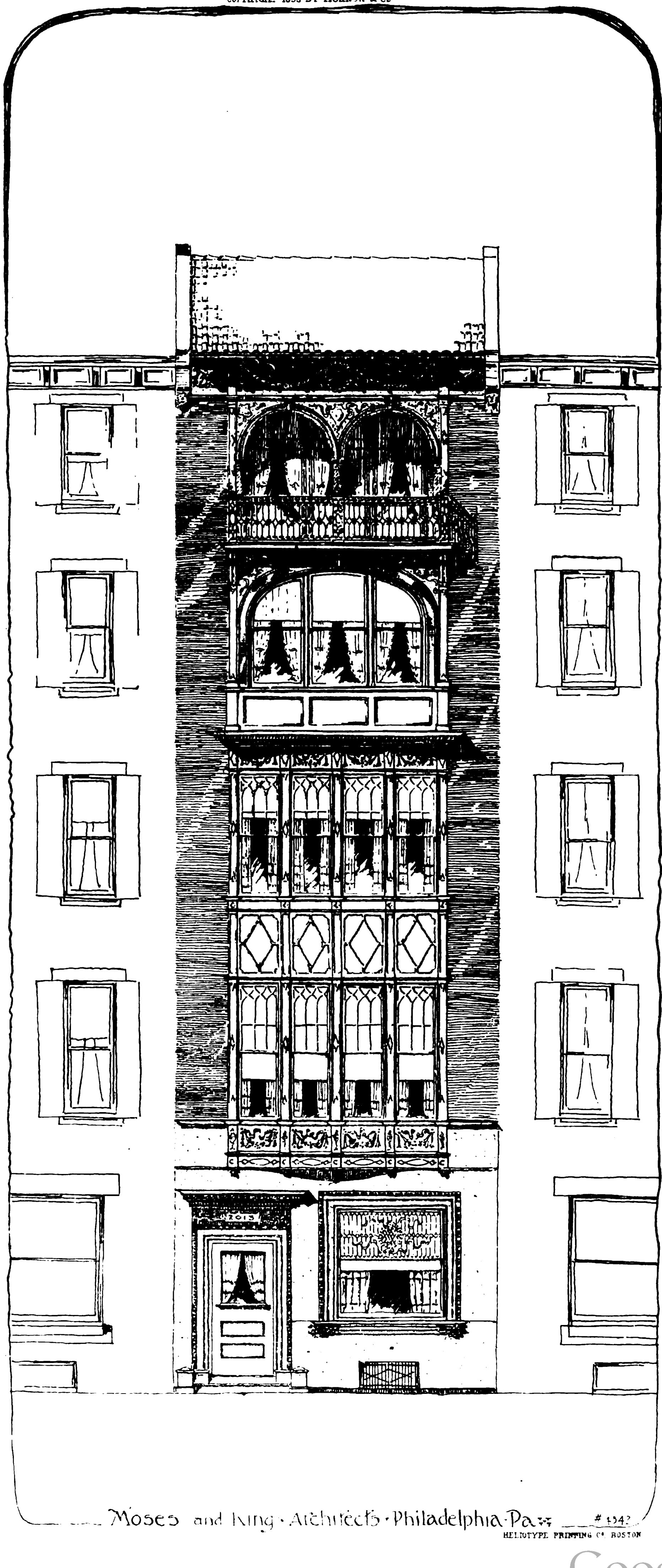
Compiled by HENRY A. PHILLIPS.

[1] Buildings used for mercantile or manufacturing purposes, and where a sewer connection can be made, shall have in basement or cellar such a connection that may be readily opened in case building is flooded. Location of such sewer connection shall be indicated by permanent and conspicuous sign on wall near ceiling, and always kept in sight.



Design for Theological Seminary, Lancaster, Pa.

General View.



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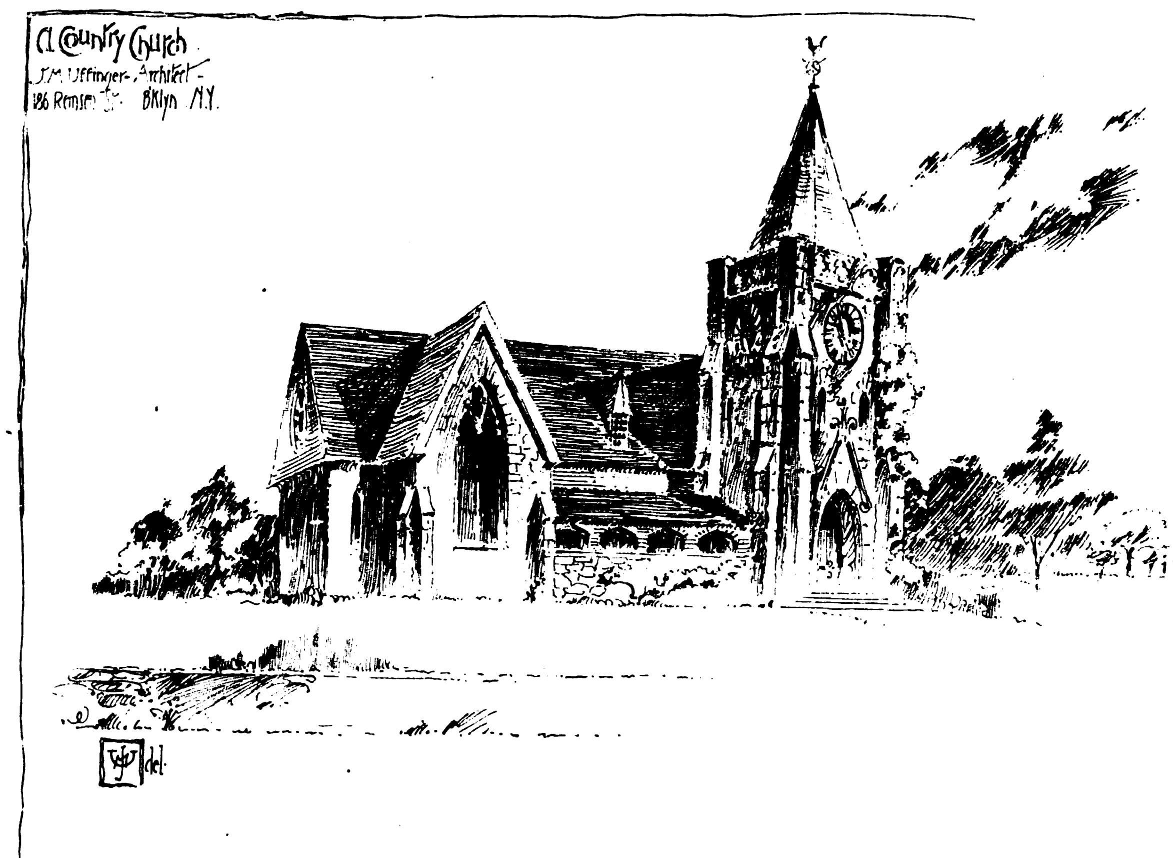
Heliotype Printing Co. Boston

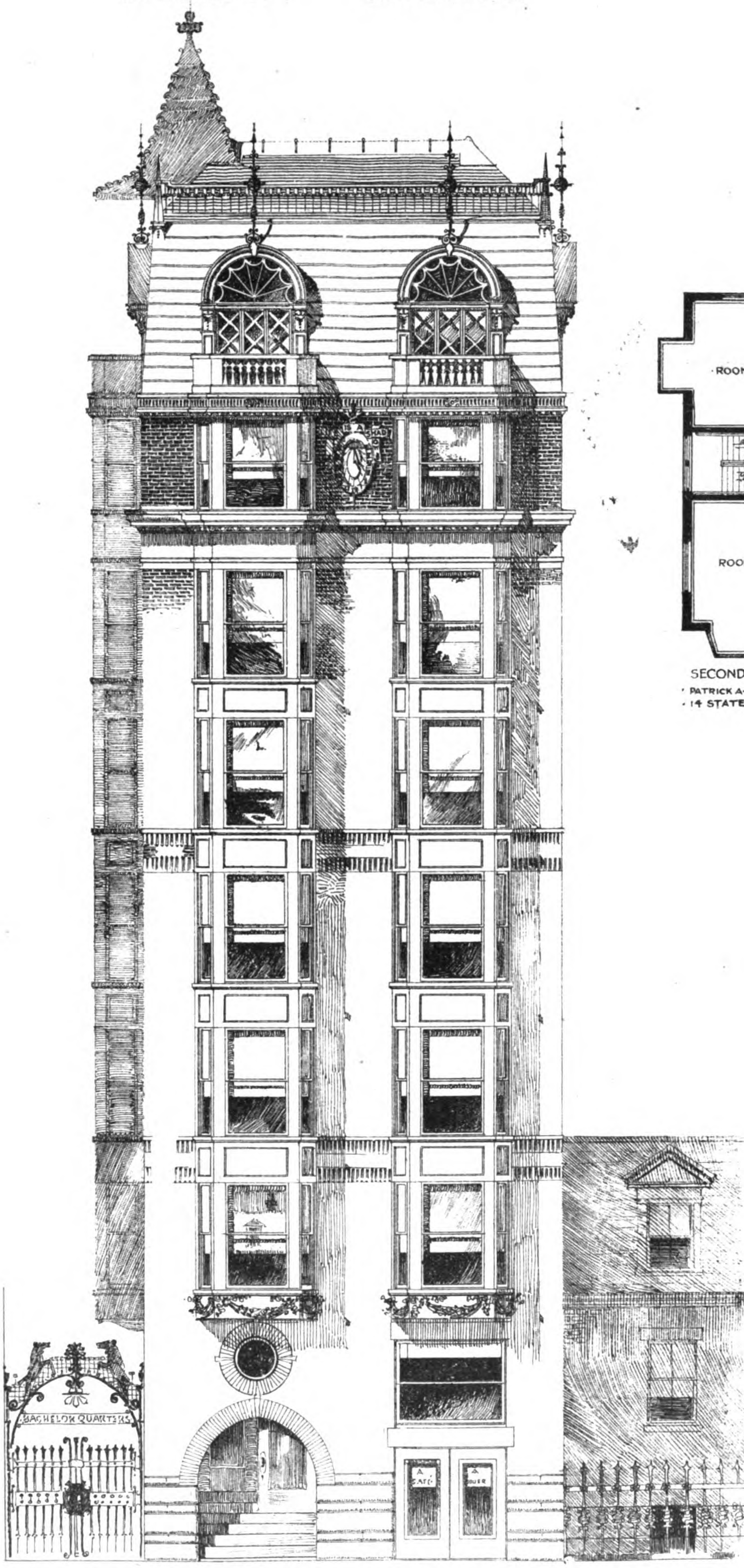
AMERICAN ARCHITECT AND

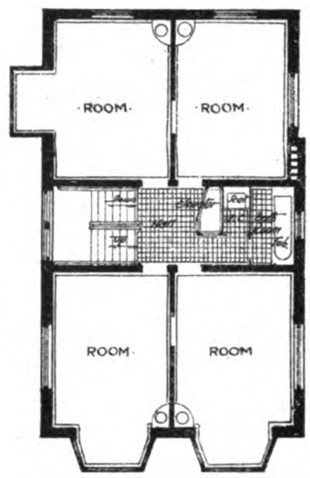

Kitchen
Hall
Living Rm
Toll Gate
Sketch Club of N.Y.
Submitted by Justin M. Uffinger
del


A Country Church
J.M. Uffinger, Architect
186 Remsen St. B'klyn N.Y.
del

·BACHELOR APARTMENTS·

·ON WILLOW ST· BOSTON. MASS·





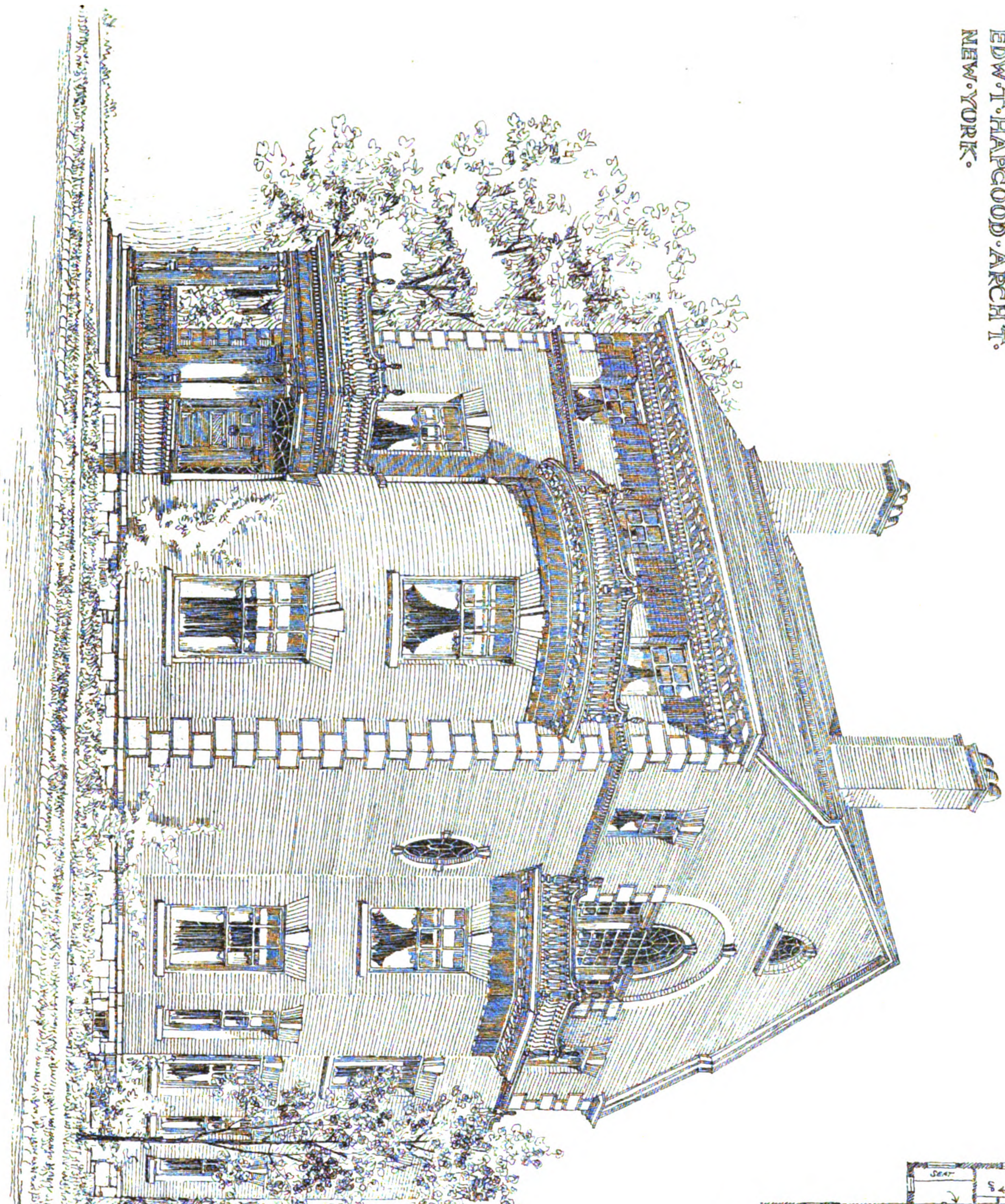
SECOND-FLOOR-PLAN & ABOVE·
· PATRICK A. TRACY, ARCHITECT·
· 14 STATE ST. ROOM, 49·

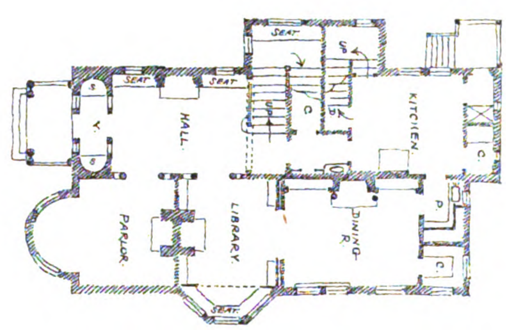
·WILLOW ST· FAÇADE·

HELIOTYPE PRINTING CO. BOSTON.

AMERICAN ARCHITECT AND BUILDING NEWS, MAR. 18. 1893. No. 899.

HOUSE FOR
A.G.LOOMIS.ESQ.
HARTFORD.CONN.
EDW.T.HAPGOOD.ARCH'T.
NEW.YORK.





HARD TIMES IN THE COLONIES. — AN EMIGRATION MOVEMENT TOWARD PATAGONIA. —NEW THEATRES.—AN ELABORATE BAR. — THE EQUITABLE LIFE BUILDING.

SYDNEY, January 23, 1893.

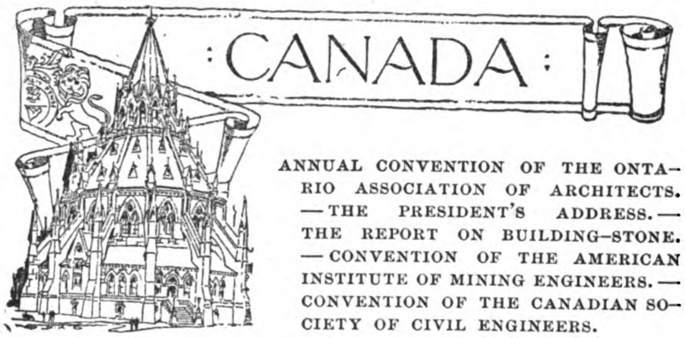
ARCHITECTS are still grumbling at the lack of business here, and even the general feeling of hopefulness which usually comes with the opening of the new year, if it exists at all just now, is certainly not very pronounced.

Eighteen ninety-three begins with the announcement of a large deficiency in the Treasurer's Department, and various modes of retrenchment are being devised to keep the public expenditure within reasonable bounds, and an income-tax is to be imposed for the purpose of raising revenue to meet existing liabilities. The Australian Governments are such large employers of labor that when retrenchment becomes necessary the effect is felt by all classes of the community.

Our government statistician, too, has been compiling a doleful list of the persons who during the last year brought themselves within the jurisdiction of the Insolvency Act, from which it appears that 1,500 failed, and that in the aggregate their deficiencies amounted to a million and a quarter pounds sterling. To show what three bad years have brought us to, the founding of a "New Australia" is seriously talked about, and the part of the world chosen for the establishment of this latest Utopia is Patagonia, or Argentina, as they fondly call it here. That a continent as large as Australia should be unable to support less than four-and-a-half millions of people seems too absurd for remark, and yet this mad scheme of emigration is actually about to be put into execution! If it were not for the feverish anxiety to amass wealth quickly, these visionaries would, one may be sure, find it better to face the ills they have in their colonial homes than fly to others, which they know not of, in Argentina. Yet, these troublous times notwithstanding, there would seem to be no dearth of money where amusements are concerned. As proof of this, if proof were needed, it will be sufficient to mention that two of the Sydney theatres have lately been reopened: one, the Theatre Royal, rebuilt after destruction by fire last year, and the other, the Criterion, which has been closed for some months while the building was being enlarged and re-decorated. The three other theatres of which the city boasts are kept going almost constantly, and within the last few weeks we witnessed the opening of still another, the Lyceum, in Pitt Street, which is, undoubtedly, one of the largest and most sumptuous places of amusement in the Colonies. The front of this building is an imposing design of a Queen Anne character, carried-out in red brick with cement dressings. The fatal facility with which this latter material can be made to assume decorative forms has proved a temptation to the architects (Messrs. Backhouse & Laidley) which they have, apparently, been unable to withstand. The pressed-cement-work, as a consequence, is too assertive, and there is about the whole building a lack of that restraint which lends a charm to even the most artistic work. But, taken as a whole, the building, externally, is striking and effective. Internally, it is exceedingly well arranged, and nearly every one of the two thousand people it is capable of seating can both see and hear what is taking place on the stage; and this, after all, is more than can be said of many a more pretentious playhouse. To attain this end, the usual outward curve at each end of the horseshoe in the three tiers has been done way with, and though, in appearance, the form is less graceful, still the end aimed at seems to have been successfully attained. The theatre is well ventilated, and the sliding roof allows the air to be thoroughly changed in the auditorium between the acts. This open-roof arrangement is now regarded as essential in all our theatres, and it is certainly conducive to comfort, when the thermometer is verging on 90°, to feel the cool, fresh air on one's face, and when one's eyes are aching with the glare of the lights on the stage it is pleasant to be able, without leaving one's seat, to look out on the night and the stars.

Another recently completed work which calls for notice is the new bar at Tattersall's Hotel, on which, as has been stated, over £22,000 have been expended. Everything that money could do has been done for the adornment of this bar, and yet, to say the least of it, the result is not satisfactory, for the simple reason that the thing has been overdone. The most costly marbles line the walls; the ceilings impress one as being masses of ornament overlaid with paint and gilding; the floor is laid with expensive mosaic, and the American-walnut buffets and bar-counters are rough with elaborate carving. Round the walls of the bar itself are decorative panels from the brush of Mr. J. R. Ashton, ex-president of the Art Society of New South Wales. The artist has done his work well, and these picture-panels and the stained-glass are the most satisfactory portions of the work. The glass, indeed, is the best ever made here, and the designs, also by Mr. Ashton, are models of what work of this kind should be. Everything has been well done,—some of the workmanship is really excellent,—but the effect of all the lavish expenditure has come perilously near degenerating into vulgarity.

In curious contrast to this sumptuous gin-palace is the calm and dignified refinement of the new building in course of erection for the Equitable Life Association of New York, which is now becoming a prominent feature in George Street. Of course, no comparison can be instituted between the two, as one is only an elaborate piece of decoration and the other is a stately block of offices. But the decoration in the one is so loud and fussy that the quiet dignity of the other is emphasized, and it immediately suggests where the fault of the former lies.



ANNUAL CONVENTION OF THE ONTARIO ASSOCIATION OF ARCHITECTS. — THE PRESIDENT'S ADDRESS. — THE REPORT ON BUILDING-STONE. — CONVENTION OF THE AMERICAN INSTITUTE OF MINING ENGINEERS. — CONVENTION OF THE CANADIAN SOCIETY OF CIVIL ENGINEERS.

THE Ontario Association of Architects held its third annual convention on the 7th and 8th of February, just too late to admit of an account of its proceedings being sent in the February monthly letter. Although the attendance was not quite so large as on former occasions, the gathering was thoroughly representative and a considerable amount of important business was carried through, while the general tone of the convention showed that the Association was a lively body of men, who fully appreciated the benefits of the Association and intended to work hard for its success and the development of the important issues it has in hand. A few quotations from the opening address of its President, Mr. S. J. Curry, will show what has been the principal work of the Council in the past year and will describe the position of the Association with regard to its objects. The address was very able and thoroughly businesslike and was couched in terms expressive of great earnestness, such as must have very favorably impressed the hearers with the efficiency of the Council, while it will have the effect of inspiriting and rousing up those members who, according to the report of the Registrar, which followed, were apparently flagging in their interest, through being unable to discover any personal advantages to be gained by a continuance of their membership. The President said: "This is the third annual meeting of the Ontario Association of Architects, and I believe it will be considered in the future as having been weighted with most important issues. At this meeting many questions of vital interest must come up for discussion and settlement. The life of the Association depends upon the action the members may take during the convention. We have nearly reached the critical point of our existence, which many of us have seen coming from the beginning and which, if safely passed, will carry the Association forward to a period of great usefulness.

"This Association is working under an Act of the Provincial Legislature, which, to all intents and purposes, gives us neither benefits nor privileges, while it imposes on us the duty of educating the future members of the profession, that the public may be benefited in the future. The Act is of so little practical benefit that it was only after considerable discussion and consideration that it was determined to try to carry out its provisions. This decision was arrived at only when it was pointed out that we could not expect to obtain all we desired in our first effort and that there was reasonable hope that we should eventually succeed in having the Act changed so that it would really serve the purpose for which it was passed. As you will see by referring to the report of the Council, an effort was made at the last session of the Legislature to have the Act amended. We found the opposition from the members of the Legislature against legislation, having the slightest appearance of giving special privileges to any profession or organization, so strong that it was worse than useless to press it at that time. . . . Our Council has been pursuing a course which they think most likely to lead to eventual success, that is, to try and carry out the educational features of the Act, and thereby show that we are in earnest in our desire to improve the professional standing of our members. The public have no sympathy with us in any efforts unless it can see some direct benefit to itself. We must, therefore, take up the measures in which the public is directly interested before we attempt to improve our condition as a profession in those respects in which we are more directly interested as practising architects. The difficulties in the way of obtaining amended legislation can only be properly understood by those upon whom the duty has been imposed of getting the desired legislation. At this point, I would like to draw the attention of the members of the Association who reside outside the cities to one of our difficulties in obtaining such changes to the Act as nearly all of us believe to be necessary to its successful working, and that is, that while it is possible to convince the city members that there is danger to life and health from the incompetency of an architect, simply because they live in

large centres of population and can see the result of such incompetency, it is next to impossible to convince the average country members that any danger exists. . . . The Council interviewed the Government two weeks ago and have reason to believe that we may succeed in having the Act amended by the striking-out of the word "registered" where it occurs in the Act, if each member will do his duty in the premises. . . ."

The President went on to review the work of the examinations, and pointed out the necessity of this work being effectively carried out, both for the objects of the Association and for the benefit of the members individually, who would have the advantage of being able to obtain trained assistants ready for their work, instead of having to educate them for themselves. Some seemed to consider that it was an expense which the Association should not have to bear — that students should pay a sufficient sum to clear all the costs; but it was evident that if the student were asked to pay high fees he would not come forward, and the work of education would be blocked at the outset. The address then referred to the library of the Association, and regret was expressed that members had not made such practical use of it as they might have done. The library was small at present, but it was the intention of the Council to purchase, by degrees, such books as could not, as a rule, be bought by architects individually on account of their expense. The practice by which members living at a distance could have these books sent them by paying the postage made the library as accessible to them as to city members, and would undoubtedly prove an inestimable benefit to them. "The Council was instructed at the last convention to determine what could be done to protect an architect's design from being used by a second party without compensation." Under the present Copyright Law, the sub-committee which had dealt with the subject found that nothing could be done to remedy the evil.

The President then dealt with the various occasions upon which the Council had acted in reference to appointing members to assist the promoters of competitions in coming to fair and satisfactory conclusions, to the various subjects upon which deputations from the Association had been to Ottawa to interview ministers in connection with the objects of the Association, and dealt at large with the subject of fees to be paid by members, some feeling having been shown by members who did not really comprehend the nature of the work done and to be done by the Association that the fees were higher than necessary. In conclusion, the President referred feelingly to the death of the late president, Mr. W. G. Storm, who had worked so earnestly for the advancement of the Association, even to the sacrifice of his material interests.

The reports of the Treasurer, Registrar and Librarian were then read, followed by the report of the Council, whose work has been practically outlined by the notes given above of the President's address.

A considerable amount of discussion followed upon "business arising out of the minutes," which was, perhaps, of local rather than general interest, and need not here be entered into; and the meeting adjourned, the members being well satisfied as to the work accomplished in the first afternoon of the convention.

In the morning of the second day a paper was read on "Iron Fireproof Construction in New York," and some tests of material were made on the machines of the School of Practical Science, in which building the convention was being held. In the afternoon session Mr. Gregg brought forward a scheme for dividing the Province of Ontario into sections in which "Chapters of the Association should be formed." The matter was very thoroughly discussed, but it was decided that, while it would be well to have some such scheme carried out in the future, it was as yet somewhat too early for its inauguration.

It was decided to change the time of the annual convention to January instead of February, the date decided on being the second Tuesday in the month. Voting by letter-ballot was then taken up. Mr. Arnoldi, from Ottawa, represented that there were sixteen members in Ottawa, of whom he was the only one able to come up, and that, while they took great interest in the work of the Association, they were debarred by the existing rules from voting in the elections. The motion to have the by-laws changed to admit of voting by letter-ballot was, however, lost, it being the general opinion that if this were permitted one incentive to attendance at the convention would be lost, and that it would tend to reduce the attendance very materially.

In connection with the library, an important direction was made to the Council, which was that they were empowered to invest a sum of money out of the capital of the Association in the purchase of books. When all the business had been disposed of the elections were proceeded with, resulting in the return of Messrs. Frank Darling, David B. Dick and Edwards (of Hamilton) to fill the positions of the three retiring officers. Mr. D. B. Dick was elected president of the Council. The proceedings terminated with sundry votes of thanks. The city members gave a dinner in the evening to their *confrères* from the country.

One very important proceeding of the convention was the reading of the report on "Building-stones of the Country," prepared by the sub-committee appointed for that purpose some time ago. This is a very important document and great labor has been expended upon its production, the intention being that the results of the tests made shall be printed in book-form and circulated for the information of those interested. We could not give the matter in full, the tables themselves would take up more space than this whole letter, but we may make a few notes. The report concludes with the clause, "Specimens of all the stones tested have been preserved and a complete set of these, together with all data connected with the tests, including, in most cases, photographs of the stones broken, will be kept at the School of Practical Science and at the offices of the Association for the benefit of those wishing further details." The tests were conducted at the School, "the stones first sawn into cubes, set in plaster-of-Paris in a steel frame made for the purpose, and brought to perfectly parallel faces by rubbing." The report describes twenty-six kinds of stone, each one from a different quarry, and four tests were made of each kind. Of the twenty-six kinds, fourteen were sandstones, eight limestones, one dolomitic limestone and three granites. With each stone a full description is given of its formation, chemical analysis, color, location of quarry and means of shipment or transportation, and in tabulated form, its dimensions, crushing-load, crushing-stress per square inch, and the average crushing-stress of the four specimens per square inch. This report is a very valuable production of the Association and should prove of great value to all interested in building operations. It is intended to continue the work of testing specimens whenever there are any to test and to have in time a complete list with full particulars of every stone in the country.

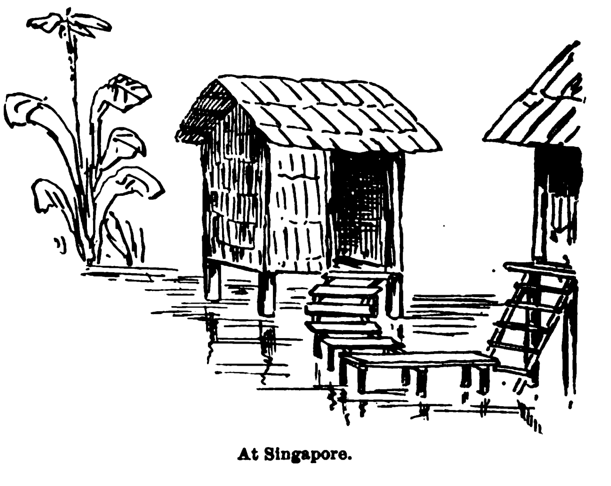
A number of local manufacturers invited the architects holding the convention to visit their establishments in a body, and provided sleighs for the purpose, an extra day being taken up by these very interesting and instructive proceedings, the country members being especially benefited by the visits.

The next events in connection with the Association will be the examinations which are to take place in the second week of March.

The American Institute of Mining Engineers held its annual convention in Montreal, in the new Physics Building of the McGill University, Montreal, on February 22d and 23d. Mr. John Birkenhead, of Philadelphia, was in the chair, Doctor Raymond, of New York, acting as secretary. The report of the Council was read. The Association is in a very flourishing condition, having a surplus of $3,463 odd, an increase of $1,750 over the surplus of last year, in addition to which there are in possession of the society certain Government bonds representing nearly $5,000, and others having a par value of $2,900. As regards membership, there have been one Honorary Member, 225 Ordinary Members and 30 Associates elected in the past year; 9 Associates have become Members, and 7 who were in arrears have been reinstated; 4 Foreign, 20 Ordinary Members; 3 Associates have been removed by death, while 25 Members and 4 Associates have resigned; 53 Members and one Associate have lapsed through non-payment of dues. The total membership now is 2,376. At the Chicago Exhibition the Association will have charge of the two divisions of mining and metallurgy of the International Engineering Congress, which will be held on July 31st, at which this Association will meet, and the meeting will be considered as one of the regular gatherings of the society. Several papers were read of a technical character, Major Powell, of the United States Geological Survey, reading one on "The Geological Map of the United States." The following officers were elected for the ensuing year: *President*, Henry M. Howe, Boston; *Vice-Presidents*, A. J. Bowie, Jr., San Francisco, R. G. Leckie, N. S., E. G. Spilsbury, New York; *Treasurer*, T. D. Rand, Philadelphia; *Secretary*, R. W. Raymond, New York.

The Canadian Society of Civil Engineers also held its annual convention on February 23d, under the presidency of Mr. J. Kennedy. The election of officers resulted in the return of E. P. Hannaford as *President;* Thos. Munro, P. A. Peterson, W. T. Jennings, *Vice-Presidents;* C. H. McLeod, *Secretary;* W. McNab, *Librarian.*

LATRINES OF THE EAST.



At Singapore.

THE proper disposal of human excreta is a subject of vital importance and is to-day occupying the attention of municipalities the world over. The subject has its economic and sanitary side. The question of waste and consequent impoverishment of the

land, with the masses reduced to paupers, gave little concern to the rulers, but when a connection was established between this material and infectious diseases which invaded the homes of the people, then the matter aroused interest and questions of public health enlisted the attention of thoughtful men.

Sanitation is a science of recent development. The terms sanitary-laws, sanitary-engineers, health-officers, etc., were hardly known a generation ago. The pages of advertisements, with their accompanying illustrations of porcelain bowls, syphon-traps, flushing-tanks, ventilating-pipes, call our attention to devices of recent origin. Plumbing has become a new profession — a science, in fact, since the enlightenment of the public on sanitary matters.

The latrines of a hotel, once so cold, dark and noisome, are now white marble halls, warmed and well lighted: in fact this region, once the most offensive feature of a public-house, is now, in all well-appointed hotels, not only the cleanest part of the building, but the air is purer there than in any other part of the structure. It is the only region where one does not detect the characteristic "hotel odor."

As a nation we pride ourselves on being far ahead of the world in the appointments of the latrine. This superiority, however, is confined to city populations possessing modern forms of water-supply and drainage. The common houses of the people, however, in our northern cities, at least, are usually better provided in these respects than many a fine house abroad.

Realizing the enlightened opinion concerning these matters in this country, it may be a matter of curious interest to inquire into the ways of Eastern people. While some of the Eastern nations are far in advance in the personal cleanliness associated with the disposition and utilization of sewage, using this term in its most restricted sense, other nations are offensive to the last degree. Indeed one is not compelled to leave Europe to find noisome conditions, and if one reverts to the habits of Europeans hardly more than a century ago he finds revealed a depravity only paralleled in China and certain parts of Russia to-day.

Aside from the curious interest that may attach to this subject there is a far more vital interest in the bearing the subject has upon public health. The question of a wholesome water-supply, whether pumped from the domestic well or distributed from larger sources by the commune, affects at once the life and health of the citizen. The fact that these supplies can be infected by germs of enteric disease is one that is established beyond refutation. The manner of the disposal of house-sewage is, therefore, one of vital importance, and if it can be shown that these nations whose methods are vicious in these respects are the ones that suffer from such diseases as a vitiated water-supply might induce, it will strengthen communities in their efforts to insure an uncontaminated source.

The nations of Europe stand in periodical dread of cholera from the regions lying east of them. The Orient stands as a continual menace to the nations of Europe, and the time may not be far distant when a propaganda in the interests of sanitary science shall invade these countries with their missionaries of hygiene to teach the people the gospel of cleanliness. That the masses might be ready to receive such teaching is shown by the success accompanying the efforts of medical missionaries beyond that of those who teach dogma alone.

With the threatened invasion of cholera and the undeniable fact that the dread disease comes from the East, an added reason is given for a glance at the methods in vogue for the disposal of egesta in these far-off countries.

China, from its enormous area and dense population, offers one of the most interesting fields for those interested in sanitary science. In no other part of the world, unless it be in Russia, can such depths of filthiness be found as in the cities of China. Mr. Arthur H.

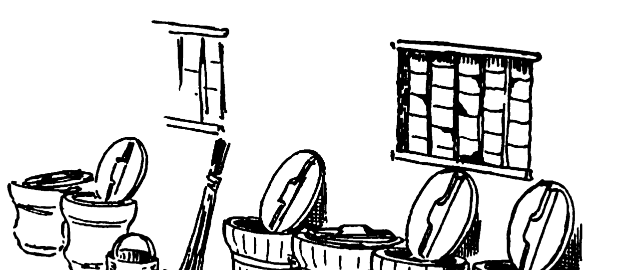


Fig. 1.

Smith, in his interesting work entitled "*Chinese Characteristics*," says that, "no matter how long one has lived in China, he remains in a condition of mental suspense, unable to decide that most interesting question, so often raised, Which is the filthiest city in the Empire? . . . The traveller thinks he has found the worst Chinese city when he has inspected Foochow, he is certain of it when he visits Ningpo, and doubly sure on arriving at Tiensin, yet after all it will not be strange if he heartily recants when he reviews with candor and impartiality the claims of Pekin!"

Dr. Robert Coltman, in his valuable book, "*The Chinese*," calls attention to the existence of various forms of enteric disease, and,

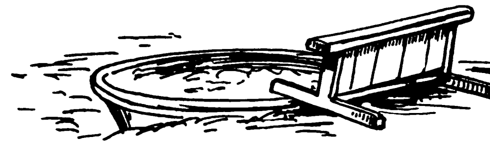


Fig. 2.

with other observers, notes that the Chinese are utterly ignorant of the germ-theory of disease, and, consequently, the persistent violation of all sanitary laws follows as a matter of course. The experience of centuries has taught them that water can be drunk in safety only after it has been boiled, an experience similar to that which has taught them that an emersion in the same fluid for several minutes would be equally disastrous to life. Doctor Coltman says, "they would look with horror at a foreigner drinking a glass of cold water," and he admits that after several severe sicknesses in his own family from drinking what he considered ordinarily pure water, he was forced, ever after, to drink only boiled water, tea or coffee. Despite these precautions, however, on the part of the natives, "cholera occurs as an epidemic every few years and is frightfully fatal. The ports seem to be affected the most, but in the summer of 1888 a wide-spread epidemic swept through Shantung and Chihli, from east to west, sweeping away thousands of lives."

In the *American Architect*, No. 859, an interesting extract is published from the report of Ernest Norfleet, past-assistant surgeon, U. S. A., entitled "Conservation of Filth in Chinese Cities." Speaking of Canton, he says: "The drainage is naturally bad, and what there is consists of several large canals that penetrate the city from the river and receive the filth from smaller canals and street-gutters emptying into them; but all these become greatly choked, and, notwithstanding the daily rise and fall of the tide, the city everywhere reeks with odors of the vilest sort, *i. e.*, to Christian noses. The natives do not seem to notice them at all. Their water-supply is taken from the river and from wells and a few springs on the north side. The wells must be saturated with the filth that seeps into them from the adjoining soil, for they are fed from the rainfall for the most part; but it is always boiled, and drunk in the form of tea or consumed in soups."

The comparative freedom of the Cantonese from enteric diseases is believed to be due to the rise and fall of the tide twice a day, the heavy rainfalls which wash out the rottenness from the porous soil, the universal outdoor work of the people, the open shops and houses, and, above all, the universal habit of boiling the water before drinking. Doctor Norfleet calls attention to the scrupulous way in which ordure is saved, and, as a consequence, pollutes the soil but little. As a matter of fact, this material is put upon the rice-fields in a fluid condition and every rainfall must wash the stuff into the neighboring canals and rivers. And here we may refer to the strenuous protests made by Dr. Letheby, of England, some years ago, against sewage irrigation, showing the grave dangers which would result.

Among the teeming millions in China, there is every reason to believe that a struggle for existence has gone on for centuries, killing off those who could not stand the microbes and bacilli of certain kinds, and, as a result, the survivors are proof against conditions that would instantly depopulate one of our cities.

Enough has been said to show the extreme filth of Chinese cities, yet I must add my own brief experience, as that will enable me to present some further details. At Shanghai, as one enters the native town he encounters men bearing uncovered buckets upon the ends of a carrying-stick; these are the removers of night-soil, and they have their regular routes through the city. If one follows these scavengers he sees them going to the banks of a canal near by and emptying the buckets with a splash into a long scow, or other kind of boat, which, after being filled, is towed away to the rice-fields in the country. The stuff is often spilled in the water by careless emptying. The canal has no current, at least not enough to disturb the green ooze and sickly yellow condition of the water, which is thick with foulness; yet beside this boat people are dipping up the water for drinking and culinary purposes. Small-pox, at the time of my visit, was epidemic in the town, and I brushed past men in the narrow alleys who were covered with eruptions; everywhere the ground was slimy with filth, and the state of the town was indescribable.

I spent a few days within the city, in the care of a Chinese student, and was permitted to make many sketches of Chinese apartments. It would seem that in the better class of houses each room is provided with a large wooden bucket with close-fitting cover. These buckets are emptied every day by a man who makes the rounds for the purpose. They are scrubbed by the aid of small shells (*Arca granosa*) which have upon them numerous ribs and nodules. A small basketful is emptied into the bucket and a stiff bundle of bamboo switches is used to stir them about. Rows of these buckets may be seen airing in the back-yard — a suggestion of cleanliness that should be recognized, in spite of the revolting idea of ever having such receptacles in the house over night (Fig. 1). The men

who remove this material are often encountered in the narrow streets, and it requires some alertness and skill to avoid being brushed by them, as they move by you in the roughest way with buckets swinging. In the back-yard of a number of houses I saw large earthen jars embedded in the ground. Against the sides of these jars was a low framework of wood (Fig. 2), and, barring a shelter above, the whole affair had all the primitive simplicity of similar conveniences all over this country. Near these places were piles of ashes from the stoves, and these were scattered over the material at times. The open character of this arrangement, while offensive to the eye, was better, in a sanitary sense, than the ordinary privy in this country, which, having its receptacle sunk in the loose soil, soon leads to the pollution of the ground and finally of the water-supply itself. Square urinals made of stoneware are occasionally seen. These are used by old people, and I was told that they also served as pillows or head-rests (Fig. 3).

Fig. 3.

In Canton the latrines are public, comparatively few houses having private ones. Wooden buckets are used in the house by women, as is the custom farther north, but the men go to the public places. As one walks through the streets of Canton the existence of these latrines is always evident to the nostrils. Occasionally he gets glimpses of these places through an open door which leads into a narrow court, and here on each side, in the filthiest possible condition imaginable, is a long row of low stalls closed by doors. A deep, stone gutter runs the length of the place, close to the wall. Across this, in each stall, are secured two narrow planks, and just in front a narrow gutter runs to carry away the urine (Fig. 4). The whole structure was solid, durable and well-built, and, with the faintest notions of cleanliness among the people, would have been much better than similar public arrangements at home. With a supply of running water in each gutter, the plan might be adopted for public latrines in this country without the slightest modification.

Our public latrines and those connected with railroad stations, while vastly better than formerly, are in many cases far from what they ought to be. A plan of a public latrine such as the one just described, or such as one may find in Constantinople, consisting of the simplest possible arrangements and devoid of all seats, is the only true sanitary device for decent people so long as one indecent person has the privilege of access to it.

Widely distributed in the city were large earthen jars bedded in the ground, and these were the public urinals.

From what I have been able to learn from Korean friends, the

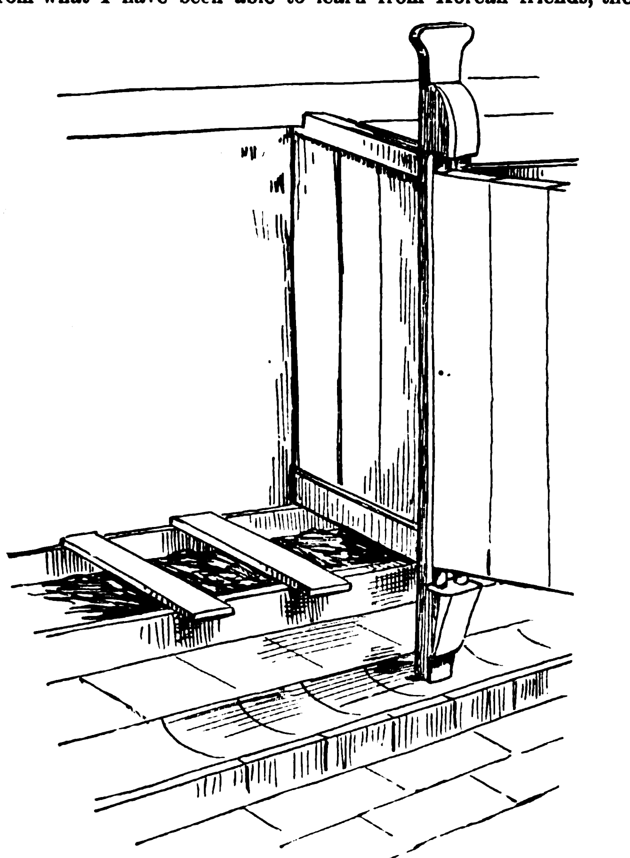
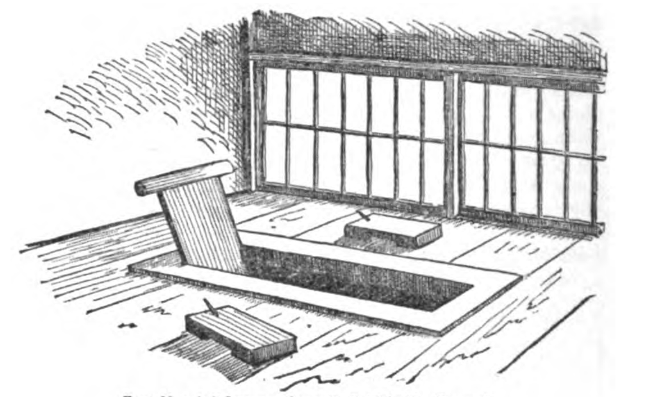


Fig. 4.

conditions in Korea are similar to those in China. Carles, in his "*Life in Korea*," says that near Soül he saw women washing clothes in a stream, and, "though the stream was low and its bed served as a dung heap, water was also being carried away from it for household uses, and there was evidence on every side that, according to all rules of sanitation, the population should by right have ceased to exist."

Japan forms a most striking contrast to China and Korea in these matters; not only does every house have its privy, but there are public latrines as well. In every house, except among the poorest



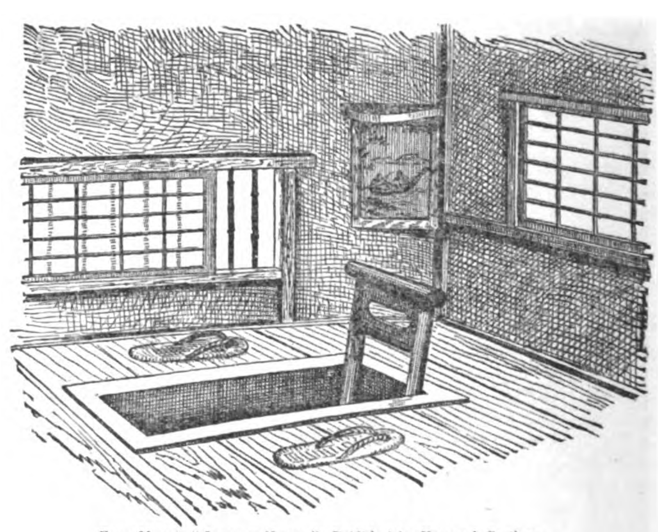
From Morse's "Japanese Homes."—Published by Harper & Brothers.—Copyright, 1885, by Edward S. Morse.

Fig. 5.

classes, one finds in the immediate vicinity of a privy a receptacle for water and a towel, which is always used for hand-washing. In the country, one often sees in the neighborhood of the poorer class of houses a covered place closed by a low door. A clever drawing of Hokusai shows that it is not beneath the dignity of a lord to avail himself of this humble convenience. Receptacles in the form of large jars or buckets are found near the rice-fields. The scrupulous care shown in the preservation of this important fertilizer is in striking contrast to the way in which we wastefully discharge it, thus polluting air and water. Frederick Charles Krepp, in his exhaustive treatise entitled "*The Sewage Question*," shows the calamities which have overtaken communities and nations who have permitted this material to go to waste. Lowell and Lawrence with their typhoid fever, and Chicago with its overwhelming problem before it, show how far we are yet from dealing properly with this great and perplexing question.

The Japanese, while utilizing this material, nevertheless contaminate their water-supply, for the irrigating material soon finds its way to the rivers, and though the danger of drinking water seems less in Japan than in China, experience has taught the Japanese to drink the water boiled or in the form of tea.

The floor of the privy has simply a rectangular opening, as shown in Figures 5 and 6, which have been taken from my book on "*Japanese Homes*." The receptacle below consists of a large earthen jar or the half of an oil barrel. This is sunk in the ground and emptied every few days by means of a long-handled bucket from the outside. The men who are engaged in this work have their regular routes and pay for the privilege. It seems incredible that a large city like Tokio, with its million of inhabitants, has this service performed in the most thorough manner. Indeed, so valuable is this substance that in Hiroshima, I was informed, in the renting of the poorer houses, if three persons occupied a room together the value of this



From Morse's "Japanese Homes."—Published by Harper & Brothers. Copyright, 1885, by Edward S. Morse.

Fig. 6.

product paid for the rent of one, and if five occupied the room no rent was charged.

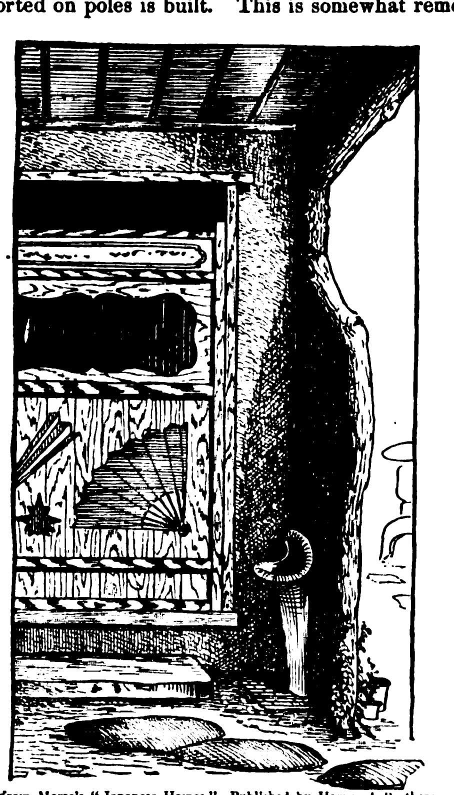
The result of the transference of this material into the country leaves the shores of a city absolutely pure. No malarious flats nor noisome odors, arising from littoral areas, curse the inhabitants, as with us.

In crowded inns much discomfort arises from the odors of the latrine, and even in the better class of houses the privy, being at the end of the veranda, is often perceptible; on the other hand, many of these places might properly be called cabinets, so exquisitely clean and beautiful is the woodwork inside and out. Figure 7, also from "*Japanese Homes*," represents the door of a privy in Tokio. This was inlaid in designs in different-colored woods, and the whole affair was a dainty bit of cabinet-work.

The urinal is usually of wood, though porcelain ones are often seen. The wooden ones are in the form of a tapering box secured against the wall of the closet. Sometimes sprays of a sweet-scented shrub are placed in these and often replaced. The refinement of the Japanese in these matters is shown by the various names applied by them to the privy, such as — *Setsu-in*, snow-hide, *Chōdzu-ba*, place to wash hands, *Ben-jo* and *Yō-ba*, place for business, *Koka*, back frame, etc.

There are certain superstitions associated with the latrine in Japan: one is in regard to the position it must be in relation to the house, the question of prevailing winds never entering into the matter. I was told that a tree called *nanten*, which bears a red berry, is often planted near the privy. Formerly it was believed that an imaginary animal called *Baku* came to eat this fruit, and also had the power of absorbing bad dreams, hence those using the closet would have their bad dreams dispelled.

On the Malay Peninsular a few closed privies are seen among the natives. By those living over the water a definite shelter supported on poles is built. This is somewhat removed from the house, a little bridge running to it, as shown in the initial cut. The floor of the convenience is constructed of a few boards with wide interspaces between. On dry land a hole is excavated and sometimes an earthen jar is bedded in the ground, over which a few boards are placed.



From Morse's "Japanese Homes."—Published by Harper & Brothers. Copyright, 1885, by Edward S. Morse.

Fig. 7.

In Siam, among the poorer classes, the privy is erected on a framework over running water, usually without covering, being a mere staging. The custom of erecting a staging over running water seems to be common among the people from Bankok to Singapore.

In this connection it is interesting to consider the ancient form of latrine in Japan. Prof. Basil Hall Chamberlain, in his translation of "*Kojiki, or Records of Ancient Matters*," which runs back twelve hundred years or more, shows that in this record the latrine is mentioned several times as being away from the house, and as having been placed over running water, "whence, doubtless, the name *kahaya;* that is, *river-house*." I may add to this the suggestion that formerly the Japanese privy was uncovered, like the Siamese type before mentioned, as the curious board that stands up at one end of the usual rectangular opening has a name in Japanese which implies this.

It would seem that in Siam and adjacent regions suffering from periodic scourges of cholera every condition for the wide dissemination of this disease was embraced. Thus, at Bankok, not only are the latrines scattered along the river, but the bodies of those dying of cholera are denied the usual cremation, and are thrown into the river or are given to the vultures, because it is supposed that the devil has been the immediate cause of their death.

Gross negligence in disposing of egesta in these hot regions is not followed by the dire evils that would result from similar methods in colder climates. In Egypt, for example, the native resorts to the desert, where the hot sun, aided by swarms of insects, soon obliterates all traces of the substance.

The natives of Sumatra and Java resort to running water, the same water being used for drinking and all domestic purposes. The banks of these streams in Java will be occupied by women washing clothes as well. When latrines are built near the inns or larger houses in Java, a bottle of water takes the place of toilet-paper, and the act of ablution is always performed by the left hand, consequently, the proffering of the left hand in salutation or other act is considered a gross insult.

In certain parts of India, I was informed that gardens and open lots formed the only conveniences for latrines, pigs acting as scavengers. In Ceylon, the wealthier classes have latrines near the house, but the poorer classes resort to the garden or retreat to the underbrush near by. In many of our Southern and Western States, outside the larger towns, and in Central and South America, the same custom prevails.

In Northern Russia, as I was informed by an intelligent Russian, alien nationalities are usually very filthy in their ways, having no conveniences whatever. In Southern Russia, on the contrary, little houses are constructed in basket-work fashion and of basket material — door, roof and all. Within is a circular opening, or a wide interspace between the planks forming the floor.

If anything would warrant a rigid quarantine against the Russian emigrant, the following extract from an article entitled "Cholera and Cleanliness in Russia" (Mr. E. B. Lanin in the *Fortnightly Review*, Vol. LII, n. s., p. 212) would certainly justify such an attitude. In speaking of inns and public-houses, the writer quotes as follows: "'The interior of these establishments,' says the semi-official journal, 'displays an inexhaustible store of disgusting foulness, eloquent signs and specimens of which cover the walls, the windows, the tables, the floors and the kitchen. The whole place is permeated with abominable smells and venomous exhalations ruinous to health. At first the atmosphere stupefies the visitor, then produces giddiness and sickness. The unpaved yards of these establishments are mere *cloacas* abounding in miasms, in the thick of which wagon-loads of fish, game and vessels containing fresh milk are left standing for considerable periods. The provisions thus conveyed in filthy vehicles and impregnated with this mephitic atmosphere cannot but sow disease-germs broadcast among the population. If to all this we add the utter absence of those elementary sanitary conveniences with which all human habitations ought to be supplied, or, what is much worse than their absence, the existence of substitutes into which it is impossible to enter, and in the vicinity of which it is dangerous to pass, we shall be better qualified to form an idea of what these nurseries of disease termed inns and public places are like.'" The writer then goes on to say: "The hygienic condition of yards, streets and public places is on a level with that of private dwellings, and the excreted refuse of houses, which, in European towns, is made to disappear as rapidly, opportunely and mysteriously as a suspected subject of the Tsar's is left as inviolate as if it were a sacrifice to the unclean gods. 'Even in our two capitals, the method of removing refuse and impurities is so antediluvian that it would be an abuse of terms to allude to it as sanitation. In the most favorable cases, the "system" consists in digging a big hole in the yard of every house and throwing into it all the garbage, offal, etc., and leaving it undisturbed for months, and for longer terms than months, until at last it is carted off in boxes and barrels to some place outside the city. It is easy to imagine to what extent the soil is permeated with filth and the atmosphere vitiated with miasms, and in what an Eldorado the microbes of infectious diseases revel. And it must be noted that even this "system," defective as it is, is followed only in favorable cases, *i. e.*, when private houses are provided with closets. As to the "system" pursued when there are no water-pipes and water is dear, it is better not to speak of it. It is a horror.'

"In Staraia Russa, Kiriloff, Tsherepovets, etc., 'cesspools are constructed under the floors of the houses'; in Samara, 'the river-banks consist of solid filth sprinkled over on the top with sand'; 'the streets of Irkhutsk are made pestilential by the putrid carcasses of dogs and cats lying half-buried in mounds of ordure'; 'the city of Veronesh is saturated with filth, the excreted impurities of the barracks oozing out into the river, on the surface of which dead dogs are occasionally seen floating about'; in Elizabethpol, 'the carcasses of dogs and cats lie undisturbed on the streets in considerable numbers.' In the most widely-circulated newspaper of Kharkoff, a city of over 200,000 inhabitants, we read among the advertisements: 'House for sale: exclusively owing to the circumstance that nearly all the neighboring house-proprietors continually throw foul water and every species of filth into the streets. Address: Pesski, Ivanovsky Street, No. 25.'"

From all that I can learn, the Greeks are equally vile in these respects, though the hot climate tempers their offences somewhat. In an extraordinary work entitled "*Scatologic Rites of all Nations*," by Capt. John G. Burke, U. S. A., a work overflowing with curious ethnological material, I find a number of allusions as to the means of disposing of excreta in different parts of the world, and these are here subjoined: "Tartars do not abide long in one place. New camps are established from time to time, to avoid the accumulations that have taken place." The Tungouses of Siberia told a traveller that "they knew no greater curse than to live in one place, like a Russian or a Yakut, where filth accumulates and fills the inhabitants with stench and disease."

According to Hawkesworth's voyages, no privies existed in Madrid till 1760, and the determination of the king to introduce these conveniences, as well as sewers, and to prevent the throwing of human ordure out of windows after nightfall, as had been the custom, nearly precipitated a revolution. Edinburgh, among other cities,

was long notorious for this disgusting practice. Privies were ordered for each house in Paris in 1513. In England, privies connected with houses of the gentry appeared in the latter part of the sixteenth century. In ancient Rome there were public latrines, but no conveniences attached to the dwellings. Portable vessels began to be used in England in 1590, and in this connection I may add that the use of these vessels excite a good deal of astonishment and disgust among the Japanese. An intelligent Japanese told me that when he first saw them he was much perplexed, and, in reflecting on the reason which led to their use by a people who seemed so sensitive and were so easily shocked by certain customs in Japan, came to the conclusion that it was owing to the coldness of the climate that led to so filthy a custom.

I have wondered what his conclusions were when he saw for the first time the typical rural device in our country, a fair description of which is here quoted from the "*Massachusetts State Board of Health Report*" (1874, p. 235):

"As to country privies, one of our correspondents has well said that they are 'a disgrace to civilization.' A philosophical friend of the State Board says that the march of civilization is in no way more correctly marked than by perfection in water-closets. If to this rule a universal application were given, it would place our farmers, as well as the vast majority of our rural population, well back in the ranks of barbarism. We prefer to believe that this is the only respect in which they are behindhand; but that they are so in this is very certain. The common country privy, unventilated, except by the door, standing over a reeking mass of corruption, either contained in a vault or lying upon the surface of the ground, a place foul and pestilential beyond description, — this must be the daily resort of every member of the farmer's family. If it adjoins the house, its poisonous odors penetrate to the living-rooms; if standing several rods away, as it frequently does, an exposure to the weather is involved in reaching it. In either case, in winter it is frightfully cold, and its use involves a chill, which, to women and children especially, coming from the warm rooms, is a potent cause of disease. Undoubtedly the constipation which is so general among country-women is in great part due to the dread of going to this abominable place."

Captain Burke, in speaking of the introduction of latrines, is of the opinion that their origin cannot be ascribed to purely hygienic considerations, since many nations of comparatively high development manage to get along without them, while, on the other hand, tribes in low stages of culture have resorted to them. He quotes Captain Cook as recording the fact that the New Zealanders had privies to every three or four houses, while the natives of Marquesas bury their egesta.

Reference is often made to the laws of hygiene recognized by the Jews as recorded in the Mosaic scriptures, such as matters connected with food, isolation of the sick, removal from camp of effete matters, etc. The burying of fæcal matter outside the camp limits is enjoined in Deuteronomy xxiii, 12, 13. This ordinance, though often quoted, does not seem to have been based on hygienic grounds, judging by the context, but solely that the Lord in walking through the camp should not have his eye offended by unclean things. The custom once established, for whatever reason, would naturally commend itself and survive, though, in the regions inhabited by the Jews at that time, the hot sun, dry air and swarms of insects would rapidly dissipate all matter of the kind.

A review of mankind throughout the world shows that only a small proportion have used even the simplest device for a latrine; an artificial device most probably arose from an agricultural and not from a hygienic necessity. The act of ingestion has been accompanied by a certain rude etiquette and with the aid of simple dishes often decorative, while the action of egestion still places the larger portion of the human race on a level with his simian relatives. In many civilized communities customs have prevailed which have resulted in grave diseases and frightful epidemics. We find at the top of another twig of mamalian descent a group of animals which has surpassed man in these matters. The cat buries its egesta. Even among nesting-birds, as the robin, the most scrupulous cleanliness prevails.

The tendency of civilization has been in the direction of better and cleaner methods. Sensitiveness to offensive conditions, like refinement in other ways, is a matter of evolution, and it can be said that the intellectural status of a community may be gauged by the advance it makes in disposing of waste-matters in a clean, wholesome and economical way. EDWARD S. MORSE.

THE STEVENS BICYCLE TOUR.

THE touring through France on bicycles, last summer, of the Stevens architectural party was a somewhat novel experience, and as their method of travel met with such delightful results and was in every way so thoroughly practical, an outline account of the trip, it is thought, may be of some general public interest.

Landing from one of the Royal Netherland mail-steamers at Boulogne, the party of twenty-three proceeded by rail directly to Amiens, from which point the cycle travelling began and was continued during the rest of the journey.

From Amiens the road lay in zig-zag route to Paris, from there down through the beautiful valley of the Loire, then north to Mont St. Michel and finally to Rouen, where, after having ridden nearly 1,000 miles, the company disbanded.

An itinerary for the entire trip of fifty days had been arranged before starting and only upon a few occasions was it found necessary to deviate from this prearranged programme.

Difficulties in the way of carrying sufficient luggage for a trip of such extent had been somewhat anticipated, but were easily overcome by the use of patent waterproof carriers strapped to the front of the wheel, and so arranged that the bundle could be quickly detached upon arriving at a hotel, the sketching-outfit or additional luggage being held in a flat case beneath the saddle, while those who had cameras carried them upon their backs or suspended from the shoulder. Possible inconveniences that might also have arisen through unfamiliarity with the road and strangeness of the country were amply provided against by the purchasing of department or road maps, which may be obtained in very complete and convenient form in all the principal towns.

The party was fortunate enough to have among their number, for a while, Joseph Pennell, who proved himself to be, if such a comparison could be made, as good a cycler as he is illustrator.

An accidental meeting with the artist, Ridgeway Knight, and the accepting of a kind invitation to spend a day at his charming home near Paris, added a pleasant and interesting leaf to the history of the trip.

The meeting with congenial countrymen in a foreign land is agreeable, to say the least, and later on at Vitré, R. C. Spencer, Jr., the Rotch scholar, was met with, who also was journeying upon a bicycle.

Many a fine château in France and not a few of its choicest bits of architecture lie away off the route of the traveller by rail, and can only be reached by a road conveyance or some such method as the one here chosen.

That it is more pleasant to spin over a strange and picturesque land in this healthful, exhilarating manner than to be whirled along over miles and miles of territory with utter disregard for its beauty and surroundings almost goes without saying. Not hampered by exacting inconvenient railway time-tables and the smoky, grimy unpleasantness of their coaches, a more thoroughly delightful method of travel could hardly be imagined. In fact, it seems to have been clearly demonstrated that in choosing the wheel a means of transportation had been selected as practical and inexpensive for its purpose as it was unique in its methods.

SOCIETIES

ENGINEERS' CLUB OF PHILADELPHIA.

AT the Business Meeting, March 4, 1893, Prof. Joseph T. Rothrock made the address of the evening, on "Wood-structure in its Relation to Mechanical Purposes," with the aid of photographs and sections of wood, projected by the lantern.

He explained the effect of cellular and woody fibre upon the strength and durability of the wood, pointing out the predominance of one or the other kinds of growth in different trees, and their consequent adaptability to different purposes.

He explained that while the so-called annual rings might be used in counting the life of a tree, in most cases this was not an invariable rule, and one might be misled in following it in some cases.

He closed by showing the distribution of the timber area in the State of Pennsylvania, and called attention to the necessity for better supervision for its protection.

His remarks were discussed at considerable length by Messrs. Birkinbine, Prince, Falkeneau, Wilfred Lewis and others.

Upon motion, a unanimous vote of thanks was tendered to Professor Rothrock for his interesting address.

THE ILLUSTRATIONS

[Contributors are requested to send with their drawings full and adequate descriptions of the buildings, including a statement of cost.]

WISSAHICKON INN, WISSAHICKON HEIGHTS, GERMANTOWN, PA. MESSRS. G. W. & W. D. HEWITT, ARCHITECTS, PHILADELPHIA, PA.

[Gelatine Print, issued with the International and Imperial Editions only.]

SKETCHES MADE DURING THE STEVENS BICYCLE TOUR BY MR. ELMER GREY, MILWAUKEE, WIS.: THREE SHEETS.

[Issued with the International and Imperial Editions only.]

SEE article elsewhere in this issue.

THEOLOGICAL SEMINARY, LANCASTER, PA. MR. JOHN C. SMITH, ARCHITECT, HARRISBURG, PA.

THE base-course from grade up to first-floor line will be in rock-faced ashlar, regular range-work in brownstone. The walls of first and second stories will be faced with selected common bricks laid-up in brown-colored mortar. The cut-stone dressings throughout will be of brownstone. The roofs will be covered with black slate, with hip-tiles and ridge-rolls. The roofs of bays at each side of main entrance to be covered with tiles. Over the entrance-arch a balcony is arranged, with open balustrade of stone. The main body of the building is two stories high above the basement.

The basement will be twelve feet high in clear and will contain heating-apparatus and fuel-rooms together with requisite space for foul-air ducts and rooms, fresh-air chambers, etc., lavatories and closets, storage-rooms and general purposes. The first and second stories will be fourteen feet high in clear, and will contain four lecture-rooms, hat-and-coat rooms, reading-room, recitation-room, faculty-room and six professor's studies. The tower is utilized on first floor as entrance to prayer-hall, and from second floor, by stairway, up to clock chambers above. Ample stairways are provided in each side hall at main entrance. The prayer-hall is one story high, entered on first floor from main corridor, also through tower entrance, and will have a seating-capacity of 250, and can be thrown open to one large lecture-room by the use of sliding partitions when desired: it is well lighted, and will be treated on the interior with open-timbered ceiling. The library is isolated from main building and will be fireproof, built of brick with stone dressings similar to main building; is approached from outside through porch entrance at end of building and connects with main building at first-floor level through covered passage-way. The passage at each end will be cut off from both buildings with iron doors, self-closing. The basement under library will be fitted up for alumni meetings. The library will have galleries approached by stairs in tower, and arranged in the alcove system for receiving a collection of 50,000 volumes. The buildings will be heated by steam or hot-water indirect radiation, and the interior finished in hardwood. The building, including library, will have a total frontage of about 212 feet. The probable cost, including site, will be about $75,000.

HOUSE OF A. G. LOOMIS, ESQ., HARTFORD, CONN. MR. E. T. HAPGOOD, ARCHITECT, NEW YORK, N. Y.

DESIGN FOR A CITY HOUSE. MESSRS. MOSES & KING, ARCHITECTS, PHILADELPHIA, PA.

BACHELOR APARTMENTS, BOSTON, MASS. MR. PATRICK A. TRACY, ARCHITECT, BOSTON, MASS.

DESIGNS FOR A COTTAGE, A TOLL-HOUSE, A PUBLIC LIBRARY AND A COUNTRY CHURCH. MR. J. M. UFFINGER, ARCHITECT, BROOKLYN, N. Y.

[Additional Illustrations in the International Edition.]

FONTAINE D'AMBOISE, CLERMONT-FERRAND, FRANCE.

[Copper-plate Etching.]

A DESCRIPTION of this fountain may be found in the *American Architect* for September 26, 1891.

FRAGMENT FROM THE COLUMBIA FOUNTAIN FOR THE WORLD'S FAIR, CHICAGO, ILL. MR. FREDERICK MAC MONNIES, SCULPTOR.

[Gelatine Print.]

"ROSECOURT," ROMFORD, ENG. MESSRS. DAVIS & EMANUEL, ARCHITECTS.

ST. FRIDESWIDE'S MISSION-HOUSE, POPLAR, LONDON, ENG. MESSRS. CLARKSON, F. R. I. B. A., ARCHITECTS.

THE Mission-house and Girls' Club (illustrated this week), situated in the midst of a very poor neighborhood in the north of the East India Dock Road, have been erected and fitted up at the cost of Miss Catherine Mary Phillimore, "in memory of those at rest and in furtherance of the work of the Christ Church Mission." In 1881 the Christ Church (Oxford) Mission commenced working in this neighborhood, the first priest being the Rev. H. L. Paget, now vicar of St. Pancras. The buildings then used were cottages which stood on the site of the new Mission-house. The part of the building occupied by the Clewer Sisters is on the west portion of the site, and comprises four stories. Plans of two of the stories are given in the illustrations. On the top story are five dormitories, a work-room, a laundry and a garden. On the lowest story is a large waiting-room for applicants for assistance and advice; part of this room will be used as a soup-kitchen in the winter. Gas-coppers are provided, raised very little above the floor. This room, and the whole of the kitchen department for the community on the ground-story, are lined with white glazed bricks.

The intention has been to provide everything required for the work of the Mission, without any excess of size in rooms or passages. "The Chapel of the Resurrection," for the use of the residents, has been placed at the southeast of the one-pair story. On the ground floor the east portion of the site is devoted to rooms for the St. Frideswide's Club and Guild for Girls. There is communication from the interior of the Mission-house to these parts of the building, which is also reached from Duff's Fields. A small complete set of rooms for the donor and a friend, to be used when assisting in the work of the Mission, forms the west portion of the one-pair story.

The building is heated by low-pressure hot water, the boiler being placed in the basement, and there are radiators in the rooms, passages, staircases, etc.

The building was carried up to the ground-level by Mr. J. K. Coleman, builder, of 120 High Street, Poplar. Messrs. Smith & Sons, of Norwood Junction, obtained the contract for the superstructure, and have also carried out fittings specially designed for every portion of the buildings.

ROMAN PILLAR AT IGEL.

COMMUNICATIONS

[*The editors cannot pay attention to demands of correspondents who forget to give their names and addresses as guaranty of good faith, nor do they hold themselves responsible for opinions expressed by their correspondents.*]

BRICK-VENEERED BUILDINGS.

FRANKFORT, N. Y., March 9, 1893.

TO THE EDITORS OF THE AMERICAN ARCHITECT:—

Dear Sirs, — As a subscriber I beg to ask through the correspondence department of your valuable paper whether it has ever been tried, and with what result, to veneer with brick a three or four story frame building on all four sides. I am aware that there will be an unequal settlement between the brick-wall and the frame. How could the bad effects of such settlemant be avoided, and what would be the best method to construct such a building? A statement of the materials used would be appreciated.

Yours respectfully, ADOLF WEGNER.

[WE trust that some architect in the Northwest, where this method of building used to be much in vogue, will give our correspondent the information he now lacks. — EDS. AMERICAN ARCHITECT.]

NOTES AND CLIPPINGS

PAINTING BY MULE-POWER. — Walter Burridge, the artist, is painting the great volcano Kilauea, the "Inferno of the Pacific," upon a canvas 412 feet long and 54 feet high, — 22,248 square feet, — which shows the wonders of the greatest crater of the globe. This painting, with the accessory spectacular effects, will form the volcano cyclorama in the Midway Plaisance, which forms part of the Hawaiian exhibit for the World's Fair. Almost directly south of the University of Chicago and east of the Cairo Street stands a polygonal building nearly 140 feet in diameter and 60 feet high. Inside the building on a circular track is a movable scaffold 55 feet in height. Well up to the top of the staging two men are at work wielding large brushes which paint in the sky on the circular canvas that lines the interior of the building, and the slapping of the brushes comes down faintly to two long-eared, loose-jointed, lazy-looking mules harnessed to the car which carries the high scaffold. These mules don't know the difference between a wash drawing and a circus-poster, but they are very large actors in painting Kilauea. A shout from above, "Hey, there, Alpher and Omega, git up!" in Burridge's voice, emphasized by a chunk of wood landing on Omega's quiescent spinal column, gives the cue, and the artist's long-eared assistants shake off the stupor of meditation and day-dreams and pull the creaking, trembling scaffold around the track until a sharp "Whoa!" sends them wool-gathering again. Painting by mule-power is one of those innovations brought out by the tremendous pressure under which all work is done in Jackson Park and the Midway Plaisance. — *Chicago News Record.*

QUERNES. — The water-mill is older than the wind-mill; but prehistoric corn — such wheat, for instance, as Pytheas, the first traveller from civilization to Great Britain, saw the natives of Kent drying in large sheds on account of the absence of sun — was ground in hand-mills, as is still done in the East. Quernes, as these mills are called, are frequently found in the cyclopean underground dwellings of Scotland. Their simplest form consists of two thin circular stones, the upper of which is pierced in the centre and revolves on a wooden or metal pin inserted in the lower one. The grinder dropped the grain into the central hole with one hand, while the other caused the upper stone to revolve by means of a stick inserted in a small hole near the edge. The laboriousness of this operation is well illustrated by a story told of Columba. He was studying under St. Finnian, and every night on

which it fell to his lot to grind the corn with the querne he performed his task so quickly that his companions enviously asserted he had the assistance of an angel in turning the stone. Wilson thinks that at this time (the early part of the sixth century) the querne was the only mill in use. Large water-mills were introduced in the thirteenth century into Scotland, and legal means had to be employed to render their use compulsory. The querne is said to have lingered in the remoter districts of that country until the close of the last century, notwithstanding Alexander III's prohibition in 1284, that "Na man sall presume to grind quheit, maishlock, or rye with hands mylne, except he be compelled be storm, or be lack of mills, quick sould grind the samen." — *The Gentleman's Magazine.*

A True Copper Age established. — At a recent meeting of the Académie des Sciences, Paris, M. Berthellot read an interesting paper on the archæological question whether there was an age of copper prior to the age of bronze. Pieces of copper have been unearthed by M. de Sarzec in Mesopotamia, which are apparently older than any found in Babylon, and more ancient than the celebrated vulture steel of Chaldea. Copper is easily reduced from its ores by carbon, but bronze requires the addition of tin, a comparatively rare metal, as it is chiefly found in Malacca and Cornwall. Its use, therefore, implied the power of making long voyages and a considerable advance in civilization. M. Berthellot has analyzed the Mesopotamian specimens, and finds them to contain no tin or zinc, and only traces of lead or arsenic. Air and water have oxidized the specimens to a mixture of protoxide and metallic copper. M. Berthellot is also analyzing a portion of a sceptre of one of the Pharaohs of Egypt who reigned about 3,500 years before Christ, and so far he has discovered no tin. Of course, a large number of specimens will require to be analyzed before the question of a pure copper age is really settled, but his researches are in favor of the supposition. We may add that Prof. Flinders Petrie has adduced much evidence from Egypt in favor of a copper age. — *London Globe.*

Cures for the Smoke-Nuisance. — Successful application appears to have been made in some of the Pennsylvania mills of jets designed with a special view to overcoming the smoke-nuisance. In one case the difficulty is met by a jet somewhat of the Bunsen-burner type, satisfactorily operating on two batteries of flue-boilers — the jet being placed above the fire-doors and immediately below the boilers — and, though the fuel is slack, yet almost no smoke is visible, even during heavy firing. In another case, steam-jets of a different, but effective, design have been applied to puddling and heating furnaces. In these the ash-pit is made tight, the steam and air enter below the grates, the furnaces being also of the usual type, except that special openings are made for air above the fire and through the bridge-wall, and when the fire-doors are closed no black smoke is visible while the steam-jets are in operation; the smoke appears above the stack whenever the fire-door is opened, but disappears immediately on closing the door. Each puddling-furnace has two jets of steam and each heating-furnace five jets, all about one-tenth of an inch in diameter. With this arrangement nut-coal can be used in the heating-furnaces and slack in the puddling-furnaces, instead of, as formerly, lump in both — the quantity of fuel required being also much less. — *N. Y. Sun.*

Test of Fireproof Materials at Berlin. — At Berlin there have been recently some very instructive experiments with fireproof materials and constructions. They were not arranged, as is mostly the case, by those pecuniarily interested in the objects examined, but by the Royal Police Fire-Brigade, working hand-in-hand with the Prussian Government, the municipality and the fire-insurance offices. The series of experiments, which lasted three days, took the form of what we might term a competition for some £5,000 in premiums offered by the fire offices, and were carried out in some warehouses lent by the municipality prior to their demolition for street improvements. Every object examined had to be subjected to the most rigid, but what may be called "naturally" arranged trials. The dwelling-house, shop, warehouse, spirit-vaults, etc., each had its turn, and in most cases the simpler means of protection had to vie with the modern patented arrangements, generally much to the advantage of the former. A report is to be published by the committee of fire experts who acted as a jury on the occasion, from which we may hereafter be able to give some extracts. — *The Builder.*

Laying Brick in Cold Weather. — "Never saw them lay hot brick in hot mortar with the thermometer 16 degrees below zero?" asked a prominent New York lawyer at Willard's. "It was a revelation to me, too. On my way home from a Western trip I stopped at Duluth. The thermometer registered the figure I have named, but building was going on just the same on a dozen brick buildings, one of which was an office-building to cost $300,000. In the East we shut-up shop in the building-line in freezing weather, because frozen mortar loses its temper and is worthless. But out there it remains below the freezing-point. As they use it, it sets before freezing, and when set it's all right. The bricklayers on a building work as close together as possible, wearing protectors on their hands. Beside them are little furnaces and metal-lined mortar-tubs beneath which are fires. The bricks and mortar are heated hot and laid. A brick, you know, will retain heat for a long while." — *Washington Star.*

Method Employed in Taking down a High Chimney. — The tearing down of a chimney 114 8 feet high, near Aachen, Germany, was effected in a peculiar manner, described in the *Thonindustrie-Zeitung.* As it was desired to utilize the bricks taken from the structure, for other building purposes, care was taken to recover them in an unbroken condition. For this purpose a cast-iron box was set up at the bottom of the interior of the chimney. The closing of its hinged door was made air-tight by a rubber strip. From the top of this box a plank chute extended to the top of the chimney; its joints were also made air-tight with putty. Into this air-tight chute of four to six inches interior width the bricks were thrown, falling upon an elastic air-cushion, landing unbroken in the box below. As the work progressed the opening of the chute was lowered by simply sawing off a part. —*Engineering News.*

Disasters caused by Electric Ground-Currents. — Constant complaints, says an American contemporary, are received by water corporations, of the corrosion and consequent leakage of water-pipes, caused by ground-currents of electrical circuits; and it is even said that in connecting gas-mains arcs have formed between the ends of pipes. The West End Street Electrical Railway, of Boston, has lately been called to order on this account, much corrosion being occasioned to the water-pipes of the city by the influence of the current generated to work that line. The electrician to the railway has pointed out the desirability of metallic returns; and it has been suggested that a provision to this effect should be inserted in Acts empowering future lines to lay tracks for electric street-railways. This is a matter that deserves the attention of our County Council now that there is so much talk of opening fresh electric railways in London. — *Invention.*

The Big Bell at Moscow. — Russian journals are occupying themselves with the question of the restoration of the great bell of the Kremlin. This bell, which is twenty-one feet high and weighs 193 tons, fell from the tower and was broken during the conflagration of 1737. It buried itself so deep in the ground by the fall that for a long time the idea of excavating it was not seriously considered, and this was not done until the reign of Nicholas. Sixty years ago it was placed on a granite base by the French architect, Montferrat. The engineer, Sometkovitch, who has a project for its restoration, estimates the expense at 3,000 rubles. — *N. Y. Commercial Advertiser.*

TRADE SURVEYS

Unfortunately, undue importance is attached by the business interests of the country to financial and speculative possibilities — the possibility of general and deeply-seated stringency, the possibility of lower or higher prices in the great staples and leading commodities. Politicians and the late political campaign are also responsible, in a measure, for the unsettled state of the public mind on financial matters, because so much was said by politicians, editors and others of the dire impending disasters that could only be averted by the acceptance of some panacea platform or programme. That the dangers from an unsettled financial policy have been magnified is probable. The per capita circulation, not counting Treasury deposits, is $24, from which there has been but little variation for a long time past. It is known that certain strong financial combinations have in view the possibility of a speculative movement of wide proportions, and involving a large number of well-known securities, which possibility is related to another, viz, the solution of the legal relationship between a gold and a silver dollar, and the establishment of a fixed policy with regard to the non-coinage of silver. If these foundations could be safely laid, the highway to a grand speculative movement, these people think, would open up. They take it for granted that values, in general, are unduly depressed. They say that if the pressure is removed they will rise. They propose to remove the pressure. This is the situation in a nutshell. The question, however, is an international one, and so many things are, consequently, to be considered. The Brussels crowd are not anxious to meet again. The attitude of a new American delegation would be different from that of the last. The present professed financial policy of this country renders another conference unnecessary; yet international understandings must be established before the pressure at home can be removed. The moneyed interests desiring a speculative movement understand fully that Europe could take and retain a good many hundred million dollars' worth of American securities, to effect which is, on one hand, their objective point; on the other hand, it is to stimulate the home consumption for not only American securities, of which the future supply is unlimited, but to make it safer for capital to strike out. The lithographers have their stones cleaned and ready for the printing of a vast amount of paper in the shape of bonds, etc., but the time has not yet come. It is no wonder, therefore, that the attitude of the new man at the wheel is so watched. The contemplated speculative movement and general uplifting of values is no suddenly-conceived motive or purpose, and it would have been attempted long since but for the unsettled condition throughout the world since the Baring failure. The extended reference to it now is made as a matter of encouragement to the over-tired and discouraged heads of the industries and transporting agencies who have seen prices decline and traffic charges sag against all good and far-seeing business management. It is impossible to go farther in this direction, or to narrate the causes and agencies that are to bring in this greater activity. In fact, it would be easier to show the reason for more unfavorable conditions. Trade is not improving in mercantile circles day by day according to expectation. Trifles affect business men. In textiles of all kinds there is an exception. The distribution is large, and mills are busy both North and South. Stocks are low among retailers. The banks are obliged to strain their accommodations in many instances. Immense sums are being drawn westward. Mortgage indebtedness continues to be reduced. In some quarters banks are decreasing loans. The industries generally are prosperous, especially those depending on agriculture. Architects who express opinions say the preparations now in progress indicate full activity. Lumber manufacturers give it out that prices for Southern woods, white pine and hemlock will be, possibly, stronger than last year. The industries, so far as the saw-mills are concerned, are better managed. In industries where iron and steel are used general activity exists, as the consumption of nine million tons of pig-iron shows. The assurance of good crops and abundance of coal, ore, lumber, oils and raw material generally imparts a strong tone to the markets. There are no evidences of advances in land-values in the Western States, but quite a number of large land-purchases have been made since last autumn. It is the policy of capitalists to place money in wild lands, and at this time negotiations are well under way for some of the largest land-deals ever known.

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CONTENTS

SUMMARY: —
The Danger attending "Shopping" in Boston. — Extension of Time in the Copley-Square Competition. — The University of Pennsylvania Travelling-Scholarship. — The Causation of Fires. — Glazed Roofs proposed for London Streets. — Professor Langley's Flying-machine. 177
ARCHITECTURE OF THE LOW COUNTRIES. — III. 179
CONSTRUCTION. — XXI. 181
A NEW FIREPROOF CONSTRUCTION. 182
LETTER FROM WASHINGTON. 184
LETTER FROM CHICAGO. 185
COMPARATIVE MUNICIPAL BUILDING LAWS. — XXIV. 187
MOREAU-VAUTHIER. 187
REYNOLDS'S INSTRUCTIONS FOR ERECTING AND TESTING LIGHTNING-CONDUCTORS. 188
SOCIETIES. 190
ILLUSTRATIONS: —
The Capitol and State Buildings, Harrisburg, Pa. — Hall in the House of N. Poulson, Esq., Long Island, N. Y. — Model showing Method of Fireproof Construction devised by Mr. N. Poulson. — Houses on Jefferson Ave., Brooklyn, N. Y. — House on Lanark Road, Boston, Mass. — House at Shelter Island, N. Y. — Building at the Corner of Kingston and Essex Streets, Boston, Mass.
Additional: Town-house, Bolsward, Holland. — Competitive Design for St. Luke's Church, Winnington, Eng. — Courts-of-Justice, Frankfort-on-the-Main, Germany. — Schloss Pflugensberg, near Eisenach, Germany. — University College, Liverpool, Eng. — Shops, Mount Street, Grosvenor Square, W., London, Eng. — Middle-class Flats, Graham Road, Hackney; E., London, Eng. — The Cathedral, or Dom, Frankfort. 190
COMMUNICATION: — 192
The Roof of the Castle of Chillon. 192
NOTES AND CLIPPINGS. 192
TRADE SURVEYS. 192

BEFORE the agitation in Boston over the recent great fires there has died away, we think that some one ought to call attention to the possibility, or, rather, the imminent probability, that a fire may occur there at any moment which will be so murderous, so appalling in its destruction of life, as to make the name of Boston infamous throughout the civilized world. Two weeks ago, a large building, solidly constructed, and unusually well provided with fire-escapes, was set on fire, by the breaking of a gas-pipe, or from other trivial accident in one of the toilet-rooms. The building is said to have been provided with automatic alarms; at all events, the alarm was given very promptly; yet in two minutes after the alarm-bell sounded, the occupants were jumping from the third and fourth story windows, to escape the flames which were pressing upon them. One of the rooms was occupied by a dealer in cordage, yet the dealer and his clerks were compelled to jump from the windows, because the flames did not give them sufficient time to snatch one of the ropes which lay in convenient coils within thirty feet of them. Now, within a few hundred feet of the building which was thus filled with a whirlwind of fire in three or four moments from an insignificant beginning are several other buildings, very much larger, less solidly built, provided with open galleries, ready to carry fire in a moment to every portion of the structure, and filled from cellar to roof with what can best be described as tinder, displayed on wooden counters, or piled up in boxes of wood or pasteboard. A match, accidentally trodden upon in any part of these structures, or a spark from a cigar, if it should set fire to a piece of loose wrapping-paper, or an end of hanging lace, might, and probably would, send one surge of fire to every corner of the building, and with what result? In the Ames building there were marble stairs, between brick walls, and several fire-escapes at different points; the occupants were few in number, perfectly familiar with the building, and were to a great extent protected by the plaster partitions which subdivided the floors into offices, yet they had to run and jump for their lives; in these other buildings the stairs are of wood, without protection of any kind; the passages between the counters are so tortuous, and the exits so remote, that customers very frequently have to appeal to the clerks and floor-walkers to show them the way out; the entire structure, from cellar to roof, is practically one room, without either vertical or horizontal divisions to check the flames from penetrating every part of it; and, in place of about a hundred occupants, mostly brave and cool men, the buildings of which we now speak are crowded from morning till night with women and children, and at certain seasons the throng is so great that it requires many minutes of elbowing to make one's way anywhere about the store. In a single one of these large Boston stores twenty-five hundred girls and men are regularly employed, and thirty thousand people are known to have entered the same store in one day. Most of these come in the latter portion of the day, so that it is probably an underestimate to say that fifteen thousand people, in the holiday season, are sometimes in the building at once. What would become of these fifteen thousand people, or of at least two-thirds of them, if fire should break out, it is not difficult to predict. The great Paris dry-goods store, the "Printemps," was built with galleries, much after the manner of the Boston stores, but it was of moderate size, compared with some of the Boston stores, and was constructed entirely of stone, brick and iron. Nevertheless, although it took fire out of business hours, when there was no one in it except a few clerks, perfectly familiar with the exits, of which there were many, opening on the wide streets which surrounded it on three sides, the fire spread so fast that the clerks barely escaped, without their coats, which they did not have time enough to take down from the hooks. In the Boston stores, instead of a comparatively moderate area, as there was in Paris, with ample and conspicuous doors on three sides, we have a vast floor-space, with one main front, and a few remote and not very noticeable side-doors; and the floors, roofs, partitions and staircases, which, in Boston, are of wood, in Paris were of masonry and iron. If, then, a dozen clerks barely escaped with their lives from the Paris building, what hope could there be for fifteen thousand women and children in a great Boston store?

IT is gratifying to note that the daily press in all parts of the country — those members at least which express an interest in matters of art — have commented with high approbation on the unusual step taken by the Boston Society of Architects toward securing the remodelling and embellishing of Copley Square in that city. The movement is regarded by these commentators not as purely local but as one having a broad significance and general application. This being so, — and it was certainly the Society's hope that it should be so considered, — they justly entertain the hope that designers in all parts of the country will not feel debarred from taking part in the competition though feeling that it is a small local matter in which the coöperation of outsiders is not desired. On the contrary, the assistance of outsiders is so important a desideratum that the Society has extended the date of the closing of the competition to Monday, April 24. It seems to us that this competition, at once amicable, professional and practically unhampered by conditions, affords a very unusual and very excellent opportunity for the architects of the country to make public proof of the truth of their asseveration that problems of the class in question can be treated best by men who have devoted a considerable portion of their lives to the study of structural and ornamental design.

THE University of Pennsylvania has followed the excellent examples set in other States by private munificence, and has established a travelling-scholarship in architecture, open to candidates under thirty years of age, who have worked during the whole year preceding the examination for the scholarship in the office of some architect resident in Pennsylvania, or have attended an architectural school in the State. The award of the scholarship will be determined by the result of two examinations. The first, or preliminary, test will consist of two written examinations, one in construction and the other in history of architecture, and an exercise in freehand drawing from the cast. Only those who receive more than sixty per cent of the full mark for construction, and more than seventy-five per cent of the full mark for freehand drawing, will be admitted to the second examination, which is an exercise in design only. In making the final award, the mark in design will count for fifty per cent of the total, freehand drawing for twenty, and construction and history for fifteen each. The examination in design will consist of two parts. The first part is devoted to making a sketch-plan and elevation, for which nine hours is allowed. The sketches are then handed in, and the authors of

those considered satisfactory are to be allowed two weeks to carry them out into finished drawings. To the candidate who passes the examinations most satisfactorily will be paid, by the Trustees of the Scholarship, to be expended in foreign travel and study, one thousand dollars, the payment being, however, conditional upon proper diligence and good conduct on the part of the beneficiary. It will be observed that the programme of examination follows very closely that which has answered so well in the examinations for the Rotch Scholarship in Massachusetts. In Massachusetts a tolerable knowledge of French must be shown by a special examination, and, though not required this year, it is intended to add French to the requirements in Pennsylvania hereafter. The Scholarship is not sustained by a fund, but by subscription among the friends of the profession. The interest shown by these is, however, so great that the Trustees feel justified in announcing the Scholarship as regularly established, and the prospect is now that, before long, a sufficient fund will be collected and invested to assure the necessary income permanently. Any of our readers who may wish for further particulars should address Prof. Warren P. Laird, University of Pennsylvania, Philadelphia.

THE *Railway Review* has collected some curious examples of the way in which fires may be set. In one instance, where some waste, which had been used with mineral oil, had been thrown into a safe place, an insect crawled through it, and then, carrying some pieces of the oily fibre sticking to his body, made his way to a gas-jet. The cotton fibres which adhered to him caught fire, and he dropped, blazing, to the floor, setting the building on fire. In another case, a quantity of waste was said to have been ignited by the friction of a belt running close to it. This, however, may be considered doubtful. The friction of a belt against soft cotton is by no means of a nature to produce great heat, and a much more rational explanation is to be found in the supposition that an electric spark passed from the belt to some conducting substance through the cotton, which it ignited on its way, as sparks of frictional electricity can easily do. In fact, the electrical effects accompanying the running of large belts are quite important, and it is probable that more than one fire has been due to them. Sparks can be taken by the finger from almost any large belt in motion, and we have known a case where an ingenious engineer, by fixing a metal comb near the belt, succeeded in drawing off enough high-tension electricity to enable him to light the gas-jets in and about the engine-room without matches, by simply touching them, after turning on the gas, with a wire connected with the comb.

IN two cases destructive fires have been caused by water. In one of these, a flood caused the water to rise high enough in a factory to reach a pile of iron filings. The filings, on contact with the water, oxidized so rapidly that they became intensely heated, and then set fire to the neighboring woodwork, and the building was destroyed. In the other case, the water from the engines, during a fire, found its way into a shed containing quicklime, and the heat generated by the slaking of the lime set fire to the shed, and this to other buildings. Quicklime fires, however, are not uncommon. Many vessels carrying quicklime have probably been burned by the admission of water to the lime through a trifling leak, and no architect or builder needs to be told how intense the heat of slaking lime may be. Glass globes, which act as lenses, often set fires, and it has recently been claimed, on high authority, that the convex glasses used in sidewalk-lights are dangerous, and should be abandoned in favor of lights with flat tops. As the convex glasses receive and transmit much more light than the flat ones, particularly in muddy weather, it seems hard to be obliged to give them up, and perhaps a lens might be made, convex on the outside and concave on the inside, the concavity being equal to or greater than the convexity, so that rays of sunlight would either pass through unchanged in direction, or would be dispersed instead of being concentrated, so as to unite the advantages of the convex form with complete security.

A PLAN has been proposed for covering some of the principal streets in London, such as Oxford Street, Regent Street, Cheapside and Poultry, with a glass roof; and although it is not very likely to be carried out in conservative England, the suggestion may be a good one. There are many narrow but busy streets in our own older cities, such as Broadway between Twenty-third and Seventeenth streets, Nassau or Mercer street, or Winter, West and Bromfield streets in Boston, which could be formed, without very great expense, into arcades, after the fashion of the Burlington Arcade in London, the Victor Emmanuel Gallery in Milan, and the Providence and Cleveland arcades, by the simple process of putting on glass roofs, and the undertaking would undoubtedly be a profitable one. Although London is reported to have a rainy climate, the actual annual rainfall is only about half that of New York, and a street covered with glass would be crowded with shoppers on rainy days, which, with us, occupy about half the year. Probably a rough covering of iron and glass could be put over a narrow street for less than fifty dollars a foot, or five hundred dollars for a building having twenty feet frontage on the street, and the increase in rental value ought to repay the entire cost in three months. The inequality in height of the buildings under the roof would injure the effect of the structure, but, in practice, it would furnish a very desirable ventilation, and, by excluding vehicles from these streets, which could easily be done, they could be paved uniformly with asphalt, so as to give clean, dry and spacious accommodation to an immense number of foot-passengers. It might be objected that a glass-covered street would be hot in summer; but the great arcades already in existence do not seem to be seriously heated by the sun, even in Italy, and a light shading of thin whitewash, such as florists use on greenhouse roofs, might easily be thrown on the outside with a hose in summer.

ONE of the most important events of our time is certainly the completion of the flying-machine upon which Professor Langley has been working for two or three years. Although the newspapers, for want of any other feature of the rational and scientific proceedings of Professor Langley and his assistants upon which to base a cheap sensation, have endeavored to see something secret and mysterious about them, the fact is that every person interested in the subject has known pretty accurately what was going on, and there is not, and has not been, any attempt at "mystery" about the affair other than a natural desire to carry on the necessary experiments without the presence of a crowd of ignorant intruders. As now completed, Professor Langley's flying-machine consists of a slender body, shaped like a fish, rather than the cigar of other experimenters, and carrying two crescent-shaped wings, or "aëroplanes," of steel and silk, the larger one in front, and the other, of similar shape but considerably smaller dimensions, at the rear. The machine is driven by several small propellers, power for which is furnished by an engine, which is said, with a weight of five pounds, to develop one horse-power. Four tiny copper boilers, using gasoline for fuel, and evaporating naphtha instead of water, supply vapor to the cylinders of the engine, or, rather, engines, the little machine being divided into independent portions. No substance lighter than atmosphere is used for buoyancy, the machine rising solely by the action of the air on the under side of the inclined aëroplanes as they are driven against it. No trial has yet been made in the open air, but it is understood that one is to take place soon. Whether the machine proves to be able to fly or not is of very little importance, as the object of the trial is, of course, simply to make observations for subsequent use; but Professor Langley is not a man to experiment at random, or to make mistakes in his calculations, and it is altogether likely that it will do what is expected of it. The machine is said to have cost about fifty thousand dollars, which the newspapers think is a large sum, but it must be remembered that such men and such resources have never before been devoted to the solution of this, the most important problem of the century, and a hundred times that amount could be expended with advantage. The United States, particularly, which has always led the world in original devices, ought to support the investigation with unlimited liberality. The cost of one of our new cruisers, modelled from second-hand plans presented to us by the British Admiralty, if spent under Professor Langley's direction, would probably give us a machine which could destroy all the navies in the world in a few days, and follow up this exploit by annihilating, in a few days more, all the standing armies, barracks, forts, arsenals and other military paraphernalia on the face of the earth, without receiving a single blow in return. Such an instrument of force could not be intrusted to better hands than those of the great Anglo-Saxon republic, and, as it is sure to be successfully constructed by some one sooner or later, it is worth an effort on our part to be the first.

ARCHITECTURE OF THE LOW COUNTRIES.[1]—III.

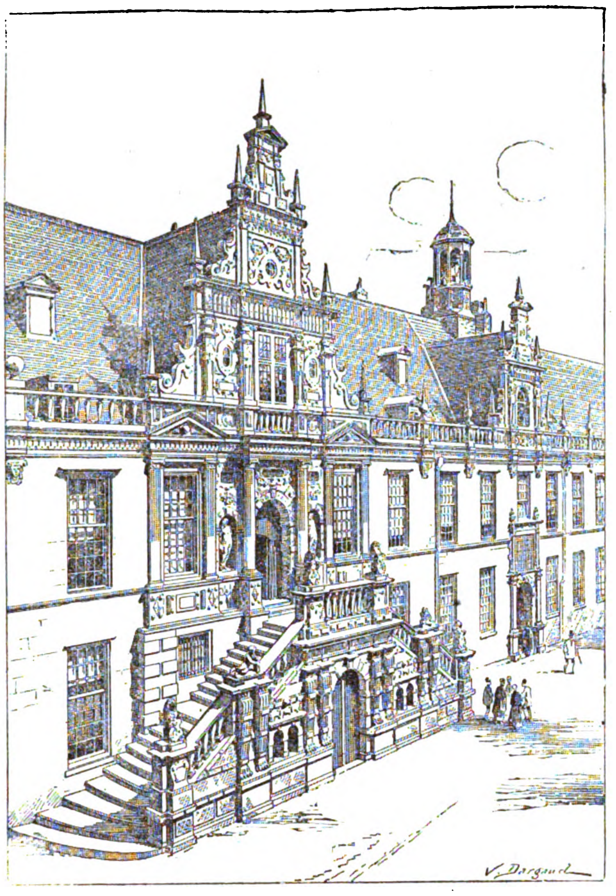


Fig. 15. Town-hall at Leyden.

THROUGHOUT the Low Countries Renaissance art triumphed over the Pointed. At Brussels, Cardinal de Granvelle erected a palace; the important Collège Vandale was built at Louvain, with a loggia above the entrance, and with a chapel surmounted by an interesting turret; at Antwerp the Maison Hanséatique was reared; at Mechlin, Margaret of Austria intrusted the construction of her palace to Rombaut Keldermans. This illustrious architect abandoned in the more modern portion the ogival style, in which he had excelled up to that time. Among the noteworthy châteaux of the period, we cite especially those of Mariemont, Binche and Boussu; the last was constructed after the plans of Jean de Breuck and of Lambert Lombart, an architect and painter of Liège, several of whose pictures are preserved in the museums of Brussels and Antwerp; in 1558, he added an important Renaissance portal to the church of Saint-Jacques at Liège, on the northern side-aisle, which was constructed in the fifteenth century, behind the Romanesque façade and tower erected in the twelfth century.

In 1527, at Leeuwarden, the capital of Friesland, an artist was born who, in the versatility of his genius, presents the most complete personification of the new æstheticism. Hans Vredeman, surnamed de Vries (the Frieslander), painter, architect and sculptor, was one of the most gifted, the most fertile and the most original artists of his day. He was a pupil of Peter Cœcke, and made his début at Antwerp in 1582, after the example of his master, by executing the triumphal arches for the inauguration of Francis of Valois, duke of Alençon; aside from the various constructions that he directed, Vredeman published at Antwerp numerous architectural collections, drawings of furniture, fountains, gardens, etc., which had a wide popularity.

He was called the Flemish Vitruvius. His influence was considerable on the art of his time, to which he succeeded in giving a strongly national impress. It was particularly the Dutch provinces that came under his sway. The town-hall of Leyden (Fig. 15) offers the most finished and the most valuable example of his masterly conceptions, for instance in the monumental perron and the three slender delicately disposed gables that adorn the long façade.

Aside from the numerous Netherlandish monuments in this peculiar style we must call attention also to the large number of edifices built for the public-weighing service, edifices which are hardly met with except in this part of the Low Countries and which, by their special dispositions, are of unusual interest.

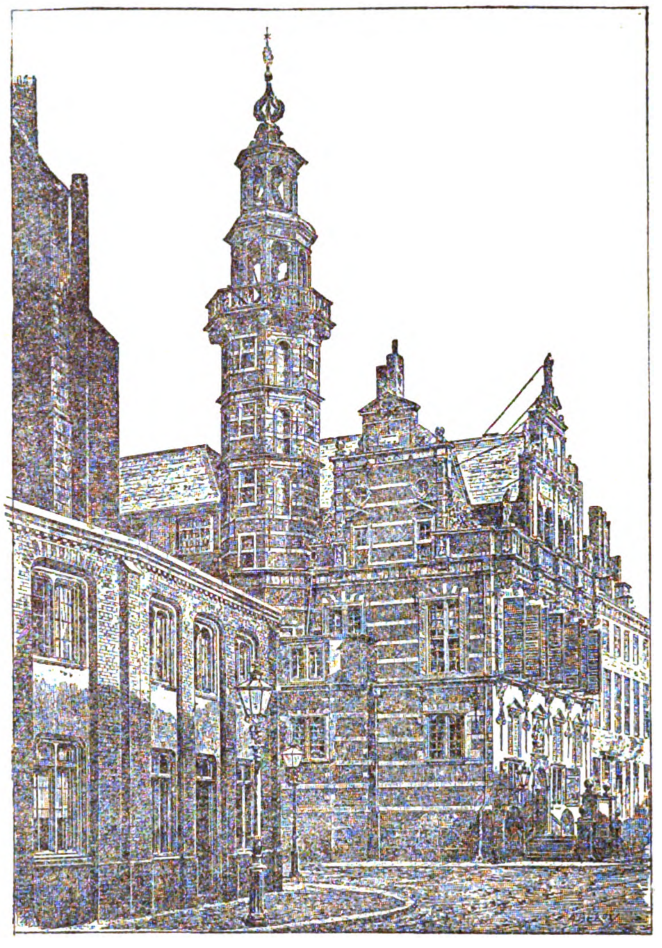


Fig. 16. Town-hall at the Hague.

The most important is at Alkmaar, opposite the canal; it comprises on the ground-floor, a vast space reserved for the public scales and for the accommodation of tradesmen. The structure is on a square plan, with one story above the ground-floor; richly decorated gables, particularly the one toward the canal, terminate three of the façades; on the fourth, that in the rear, there is a belfry with chimes. Town weighing-houses are generally designed in a very original fashion. Among the most interesting may be mentioned those of Deventer, Enkhuizen, Hoorn, and Nymegen. We must also note the construction in Holland of several important hospices; the principal are those of Leyden, Hoorn, Middelburg, Enkhuizen and Amsterdam. In a few large cities, noteworthy town-halls were still erected in the sixteenth century, among which, those of the Hague (Fig. 16) and of Nymegen are by artists who were as skilful in combining the masses as in working-out the details of a monument.

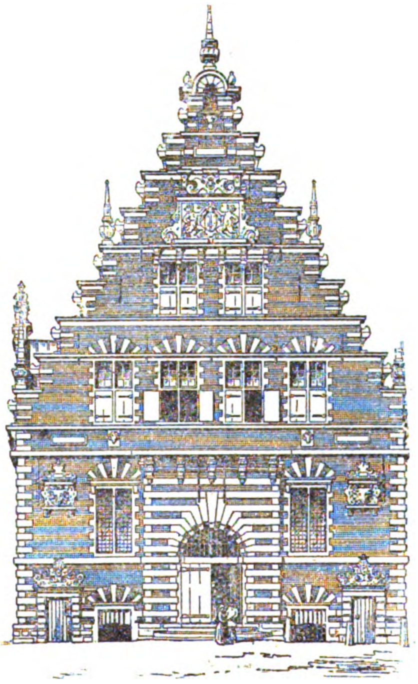


Fig. 17. Slaughter-house, Haarlem.

The Netherlandish structures of the sixteenth century were

[1] From the French of J. van Ysendyck, in Planat's *Encyclopédie de l'Architecture et de la Construction*. Continued from No. 899, page 166.

usually embellished with sculptures whose ampleness did not exclude a certain degree of delicacy; in the seventeenth century, the decoration lost in part its delicacy while ampleness of form became exaggerated. This is true of the ornamentation of the Slaughter-house at Haarlem (Fig. 17); the

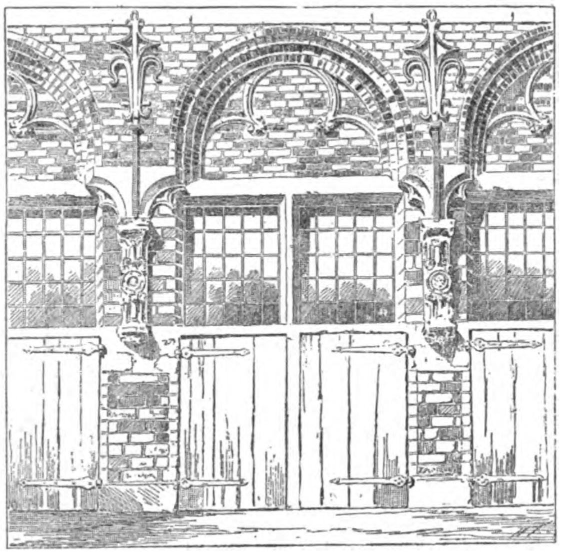


Fig. 18. Arches in the Court of the Town-hall, Nymegen.

ensemble nevertheless retains a great deal of originality and a very picturesque aspect. The town-hall of Hal is also decorated, with less distinction and masterliness, yet its *silhouette* is not without merit.

In a few Dutch provinces we remark certain typical dispositions as at Dordrecht, at Nymegen (Fig. 18) and in the principal cities of the region, where the arches are carved in trefoils and are generally uniform in shape. In other sections we find dispositions similar to those seen at Salt-Bommel (Fig. 19), and adopted for façade decoration. These are all apparently due, if not to a local school, at least to the preponderant influence of a master.

Fig. 20. House of the "Great Salmon," at Mechlin.

We have seen that already in the fifteenth century the different guilds had been able to undertake constructions of some importance at different centres; in the sixteenth and seventeenth centuries, their power and wealth increased quite rapidly, owing to the many privileges which were granted them by sovereigns and municipalities alike. It was during this period that the commercial and manufacturing cities witnessed the erection of the splendid merchant-houses and guild-houses which are still to be admired at Mechlin, Ghent, Bruges, Ypres, Antwerp, Brussels, Utrecht, Delft and elsewhere.

The house of the "Great Salmon" constructed at Mechlin (Fig. 20) by John Borremans, an architect of Brussels, for the association of Fishmongers, is one of the most remarkable of those still remaining in the city. At Antwerp, most of the guild-houses are grouped around the town-hall; at Brussels, all these precious reminders of the town's ancient prosperity are about the Grande Place, making it one of the wonders of

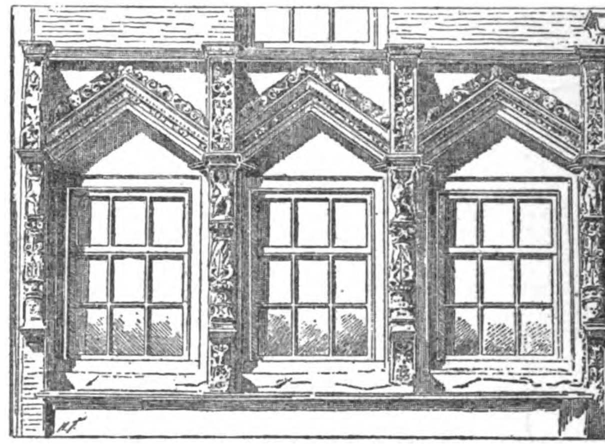


Fig. 19. Fragment of a Dutch Façade.

Europe (Fig. 21). Imagine, in fact, a vast parallelogram bordered with picturesque buildings, all differing in character and decoration, but all equally remarkable and equally sumptuous. On one side is the immense town-hall with its slender spire, the work of Jan van Ruysbrœck, the corner-stone of which was laid by Charles the Bold, then ten years of age; opposite, is the "Maison du Roi," erected by Charles V; at the right and left of this and on the other sides of the square are the beautiful houses of the craft-guilds, rebuilt for the

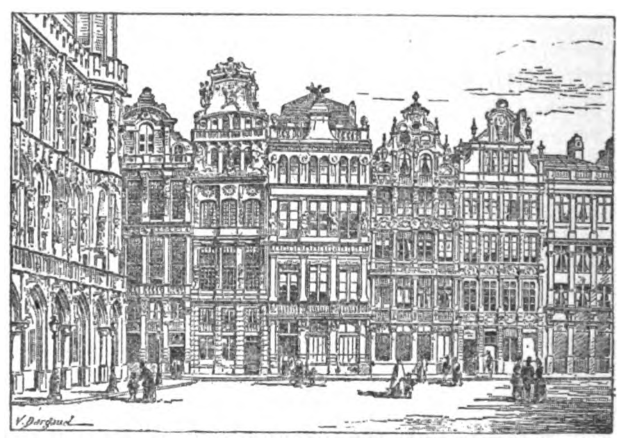


Fig. 21. Houses of the Grande Place, Brussels.

most part after the bombardment of 1695 and in the construction of which the organizations strove to outdo one another in luxuriousness and beauty.

[To be continued.]

Carbonic Acid applied to Refrigeration. — The new system of refrigeration by means of carbonic-acid gas seems likely to come into quite general favor as a substitute for the processes heretofore resorted to. The apparatus, in its improved form, consists of an evaporator, or coils, within which the liquefied carbonic acid is caused to evaporate, being afterward drawn into a compressor and raised to the liquefaction pressure; it then condenses into a liquid within the coils of a condenser, whence it flows into the evaporator and so on in a closed cycle. Liquefied carbonic anhydride evaporates under atmospheric pressure at about one hundred and twenty degrees F. below zero. In the machine, however, it is evaporated at ten degrees F., according to the temperature it is required to produce, cooling the brine surrounding the evaporator coils to within a few degrees of itself: the brine thus cooled circulates in the freezing rooms, chill-rooms, cold stores or between the ice-moulds in ice-factories, abstracting also the heat from the water or goods to be frozen or chilled. The coal-consumption and the weight of machinery required are vastly less than in any other system, and, besides this, the carbonic-acid gas employed is unattended with danger, is inodorous and non-poisonous. — *N. Y. Sun.*

CONSTRUCTION.[1] — XXI.

CIVIL CONSTRUCTION.

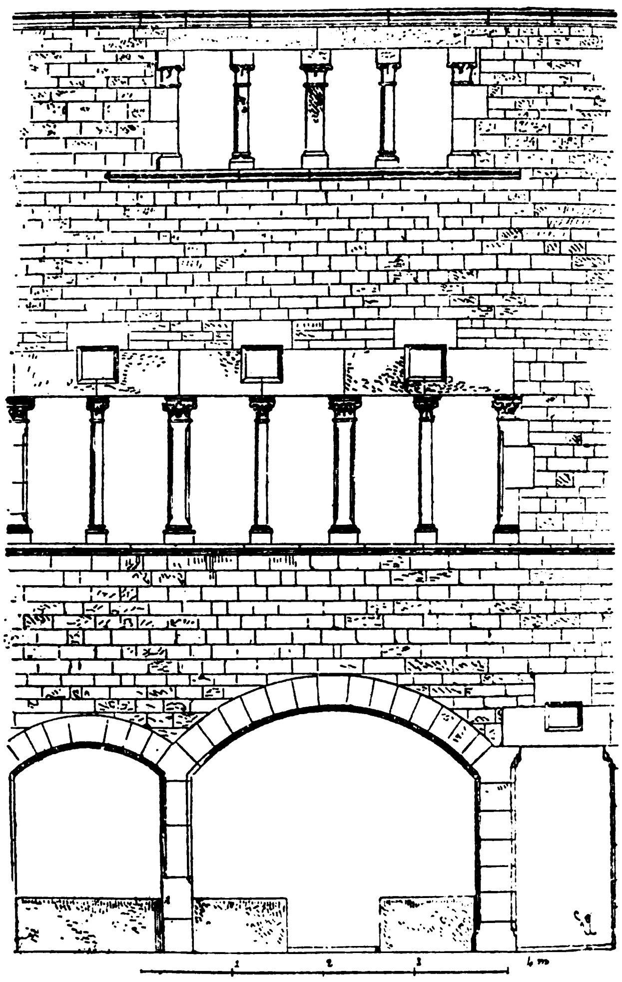


Fig. 115. A House at Cluny.

IN the early part of the Middle Ages the Roman traditions had perpetuated themselves on Gallic soil in civil as well as in military constructions; nevertheless, wood played a more important rôle than during the Gallo-Roman period. The Gallo-Roman system of construction does not differ from the Roman system; the same methods are employed, but more coarsely, so far as the execution is concerned. During the Merovingian period one meets with very frequent employment of wood, not only for roofs, but in ceilings, wainscots, porches, even the walls of dwellings. Germany and the Gauls produced timber in profusion and this material being easily employed it was natural to use it in preference to stone or brick which take time and require difficult quarrying, dressing, laborious transportation or previous burning.[2]

The conflagrations which destroyed so many towns and villages

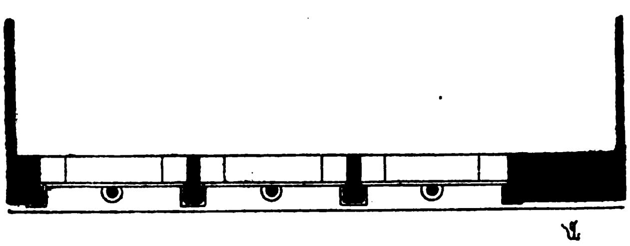


Fig. 116.

during the ninth, tenth and eleventh centuries helped to bring about the abandonment of wood in the construction of private dwellings as well as of churches. This material was no longer employed except for flooring, roofing and the partitions of dwellings. Already in the twelfth century, a number of towns showed façades of houses in dressed-stone or in rubble-work — leaving out of account certain regions deprived of quarries, like Champagne and Picardy, for example.

The monastic establishments, so wealthy in the twelfth century, set the example of civil constructions in stone and this example was followed by private individuals. It must be said to the honor of the builders of this epoch that in adopting ashlar or rubble in place of wood, they very frankly took a mode of construction suitable for these materials and did not attempt while using them to reproduce forms or arrangements which were suitable for timber construction.

Always disposed to preserve its real function and the appearance befitting it, for the material employed, they did not attempt in the least to dissimulate the nature of the materials. The means employed were, nevertheless, of an extreme simplicity and those artists who in their ecclesiastical constructions from the twelfth century onwards showed a singular subtilety, research and used such complicated methods, contented themselves in civil buildings with the most natural and the least complicated. Economical of materials, which then cost comparatively more than to-day, their dwellings are during the

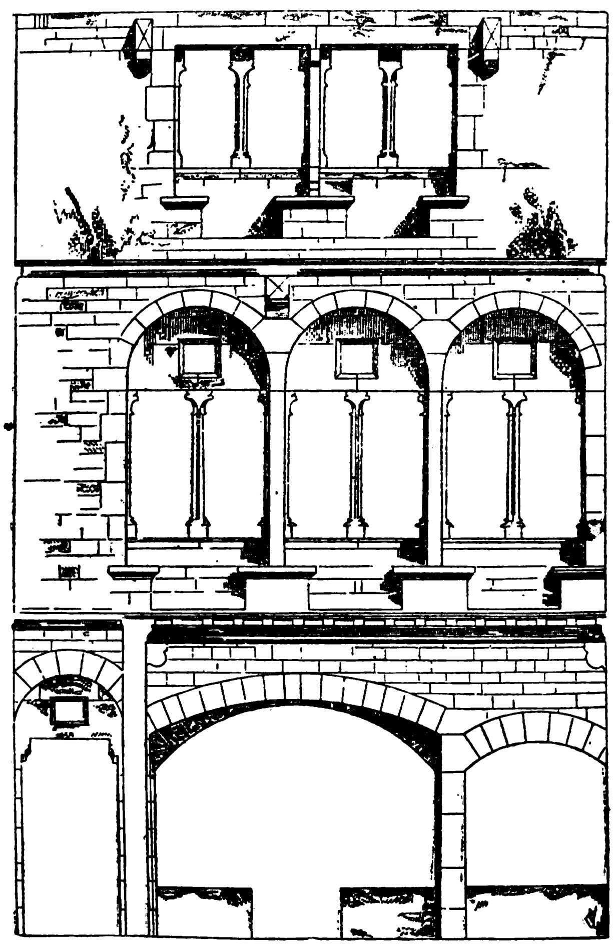


Fig. 117. Interior View of Front shown in Figure 115.

twelfth and thirteenth centuries reduced to what is strictly necessary, without pretending to appear anything more or different from what they really are, that is to say, walls, pierced with openings, carrying floors formed of exposed beams and joists, well sheltered on the street and court-yard fronts by projecting roofs, throwing the water well away from the faces. Very rarely, unless it may be in a few towns of the south and centre, the ground-floors were vaulted, consequently there were no buttresses, no projections on the exterior. Most frequently the walls are in exposed scappled rubble-work with the occasional belt-courses, the jambs and the lintels of doors and windows of cut-stone; still these lintels and these jambs are not bonded but are simply facings on the outside; — the belt-courses alone bond together the interior and exterior surfaces of the walls.

In order to give an idea of the commonest sort of civil constructions of the twelfth and of the beginning of the thirteenth centuries and of the simplicity of the means employed, we shall choose from a great number of examples one of the houses of the town of Cluny, so rich in Mediæval dwellings. Figure 115 shows the face of the exterior wall of this house on the street side. It is simply a rubble construction with a few cut stones for the belt-courses, the arches, the windows and their lintels. The lower arches open into the shops. At the right is the door to the alley which leads to the staircase. The first story shows an open gallery composed of uprights

[1] From the "*Dictionnaire raisonné de l'Architecture Française*," by M. Viollet-le-Duc, Government Architect, Inspector-General of Diocesan Edifices, translated by George Martin Huss, Architect. Continued from No. 895, page 106.

[2] It is only toward the end of the thirteenth century that the forests of the Gauls began to diminish in extent and in quality, that is to say from the moment when the feudal organization began to grow weak. During the fourteenth century many feudal lords were obliged to dispose of part of their property and the monastic establishments, the chapter-houses or the parishes cut down a notable portion of the forests of which they had become possessors. Subsequent to the wars of the fourteenth and fifteenth centuries, the forests in many localities, no longer being under the beneficial administration of the feudal system, were cruelly devastated. Those which existed on the mountains were thus lost forever in consequence of the washing-away of the soil from the steep slopes. It is thus that the south and all the centre of France at present are despoiled of the forests which once garnished the plateaus, whose existence is still noted up to the end of the thirteenth century.

and colonnettes lighting the large room. The window openings are square so as to receive movable sashes. In the lintels underneath the arches carrying the second-story wall are pierced small windows with sashes. The second story is lighted by a less important clere-story and strongly projecting roofs throw the water away from the outside walls.

In plan the first story gives Figure 116, and Figure 117 reproduces the front wall seen from the inside with its relieving arches above the lintels of the first story, the seats in the windows and the supports of the girders sustaining the joists. These principal girders placed along the front wall between the arches bond together the two parallel walls of the house and act as anchors. These were upheld at the ends by wood corbels as shown in the section Figure 118 [see "*Maison*"]. That is the simplest expression of private architecture during the Middle Ages; but civil construction did not always have such an ingenuous character. In the great dwellings, in the châteaux, the arrangements being much more complicated and the dwellers very numerous, it was necessary to provide interior divisions and separations; nevertheless, there are certain general dispositions which remained the same for the seignorial habitations as for those of the commoner. It was always necessary to have the hall, the place of reunion of the family of the commoner or the *maisnée*[1] or household, in the case of the seigneur, then the chambers with their wardrobes and their retiring-rooms and the passage-ways to reach these apartments, with private staircases. There were, then, under the same roof some very large apartments and others very small, corridors, with air and daylight everywhere. It has been imagined very wrongly that the seignorial dwellings, as well as those of the commoner in the Middle Ages, could not have been other than gloomy and sombre, badly lighted, badly ventilated.

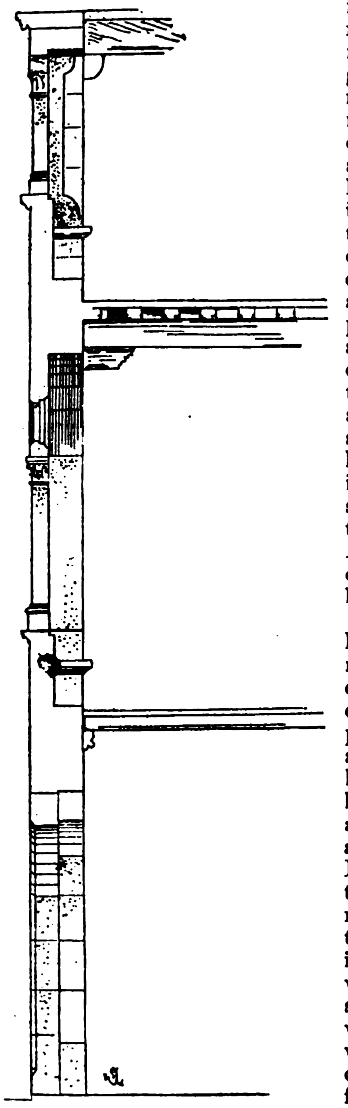


Fig. 118. Section of Figure 115.

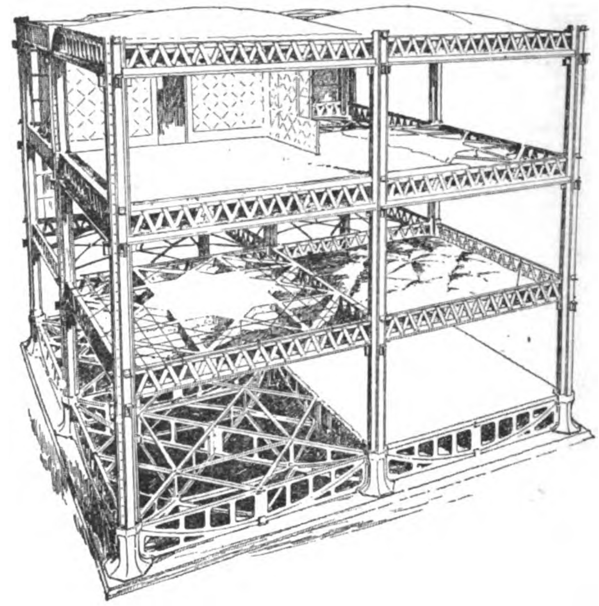
This is another of those absolute judgments which one ought not to make concerning this epoch. While the necessities of defence forbade the seigneurs piercing window openings except at rare intervals, they nevertheless sought in their châteaux light, air, view of the landscape, an outlook in various directions and the sun and breeze at will. If one will only take the trouble to reflect a moment he will readily see that men who passed the greater part of their existence in roaming over the country-side would not willingly shut themselves up, sometimes during weeks together, in gloomy rooms, without outlook, without air, without light. If the arrangements for the defence of a residence compelled the dwellers in it to get along with as few exterior windows as possible, if the court-yards of châteaux surrounded with elevated buildings were frequently gloomy and dark, these dwellers nevertheless sought in all kinds of ingenious ways to get outlooks over the country-side, air and sunshine. This accounts for the flanking turrets, the watch-towers, the battlements, the reëntrant angles which permitted windows to be made, masked from the outside.

[To be continued.]

The Method of Using the Fire-boat at Cleveland, O.—An ingenious system of fire-protection has been successfully put into practice in Cleveland, O. Four six-inch mains are laid from the Cuyahoga River to the business streets of the city, a distance of 700 feet to 1,000 feet, the mains being provided at intervals with ordinary fire-hydrants, but normally remaining quite empty, as they are laid with a slope towards the river, into which they empty themselves. In case of fire, the city fire-boat is run to the river-end of the mains, with which one of its nozzles is connected, and a good pressure is available at the hydrants, as the pumping-engines in the boat are capable of putting on a pressure of 200 pounds to 250 pounds per square inch. —*Invention.*

[1] The *Maisnée*, that is to say the household, includes not only the family but the servitors, the hired men and women and all the *personnel* of a château.

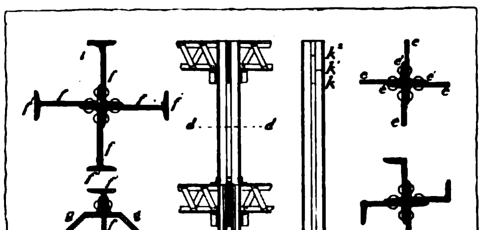
A NEW FIREPROOF CONSTRUCTION.[2]



Model showing in different stages the Construction described.

The object of the mode of fireproof construction here shown is to build more economically than is now done. In the present construction, with columns, girders, beams, arches, etc., there is a great waste of material, which cannot be avoided. In the arch-construction here shown there need not be any waste-material and the material used is used to the best advantage. The construction is as follows: In a building in which the floors are supported upon columns, metal arches and their ties are built between the columns in such a way that the strains, compressive and tensile, are being taken care of in each bay or floor between columns, so there will be no horizontal thrust from the floor on either columns or walls. The arches are made of bar L or T iron or steel, as shown on drawings. If the floor is to be supported on four girders or four walls, there is placed on the lower flanges of the girder, or on the walls, a polygon-shaped frame, from the corners of which are sprung metal arches, and where the arches cross each other they are held together with U-bolts. These arches form a metal dome, of which all the strains from the arches are taken up by the polygon ring, so there will be no horizontal thrust on the girders or walls from the arches in the floor-construction.

This completes the metal part of the construction. The plaster or cement part of the construction is made as follows: For a plain ceiling, with the metal arches showing underneath, there are placed in the spaces between the arches air-cushions, which are pressed up against the metal arches from underneath. The air-cushions will then form a dome in each space between the arches; on top of the air-cushions is spread plaster-of-Paris, or cement. After it has set the air-cushions can be removed and the under side of the ceiling can be finished, showing a groined ceiling. But if the metal arches are to be covered with plain or ornamental mouldings, they are first put up and then the air-cushions inserted between them. If the domed panels are to be ornamental a flexible mould, made from a flat pattern, is placed on top of the air-cushion; and this flexible mould may be of rubber, gelatine or any such material. After the



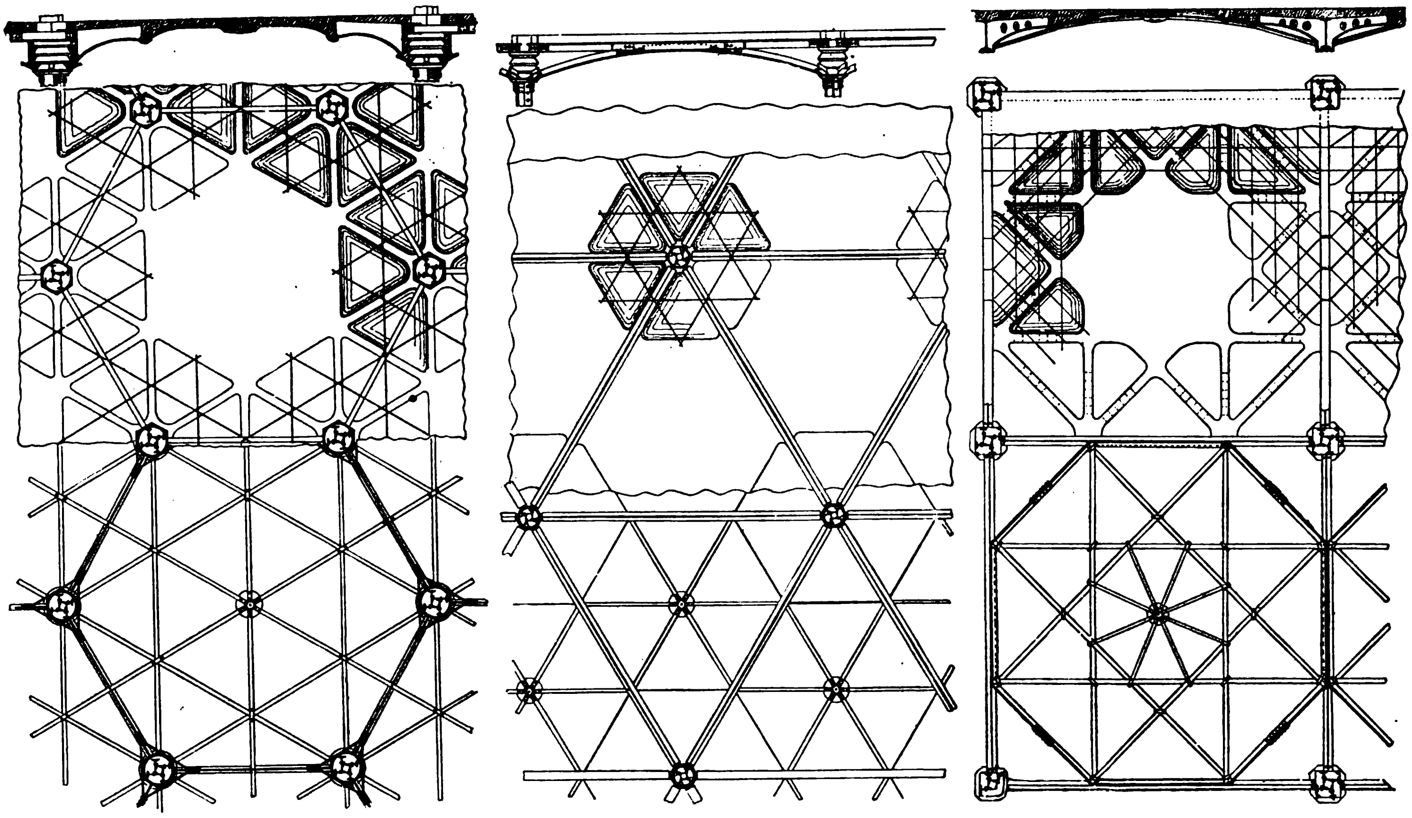
The Columns and their Connections.

[2] A paper read before the Society of Arts at the Institute of Technology, February 23, 1893, by N. Poulson, of New York.

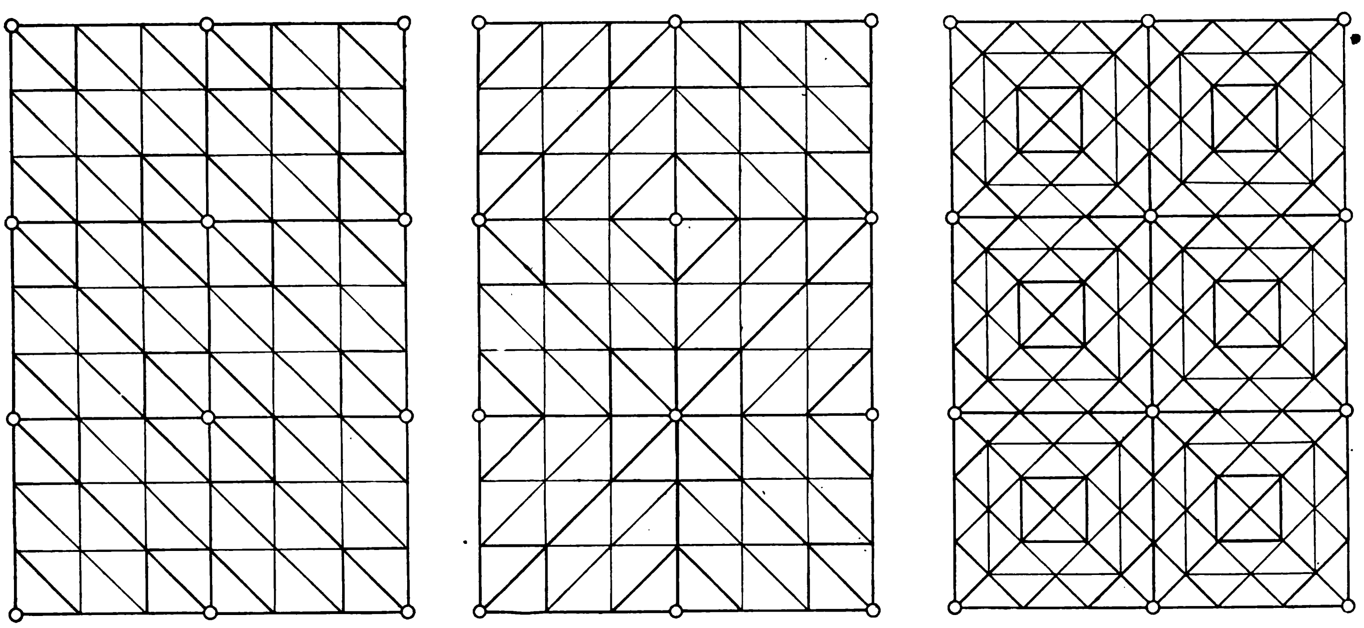
under side of the ceiling is finished there are constructed on top of the iron arches cement arches or ribs. They are formed by placing two boards parallel with the metal arches, five or six inches apart; the space between the boards is then filled with concrete. In these ribs may be left circular holes through which hot air may circulate and thereby heat the floor. After the ribs are made and the boards removed wire and wire-netting are stretched over the cement ribs and on top of the wire-netting is spread concrete about three inches thick. This finishes the floor, except the finished floor of wood, tile or cement.

Comparing the cost of the usual fireproof floor-construction, composed of girders, beams, brick arches, etc., in which there is a great waste of material, a floor constructed of beams, girders, etc., to carry 150 pounds per square foot, first the load is supported by the beams, by them transferred to the girder, and from the girder to the column; that is, the same load is carried twice before it reaches the column. The brick arches, the filling over them, the plastering, etc., have also first to be carried by the beams and then by the girder; that is, for supporting a load of 150 pounds there has to be provided metal sufficient to carry 450 pounds. If the load of 150 pounds were carried only once, and there were no dead-load of brick arches, etc., it would cost only 33.3 cents for iron, where it now costs $1.00, to support the resultant load, which is equal to three times as much load required to be supported; and if the iron beams could be made with the web lighter towards the centre and the flanges lighter towards the ends of the beam there could be saved, of the metal in the beam, at least ten per cent without reducing the strength of the beam, and this would reduce the cost to 30 cents. If there were used for supporting the load bar L or T iron, instead of beams, the cost would be reduced thirty per cent less per inch, which would make the cost 26 cents. If the above is calculated for a floor with 12″ beams, by making the beam 24″ high instead of 12″, the same amount of iron will carry twice as much, or the amount of iron could be reduced one-half, which would make it cost 13 cents; or if made 36″ high it would reduce the cost of iron to 8.66 cents, against $1.00. The above conditions cannot be met by the beam-and-girder construction, but can by the arch-construction. There the dead-load is self-supporting; the load is only carried once. Bar L or T iron is most suitable for the construction of the floor, and can have two or three feet of rise without reducing the cubic air-space in the room below.

The cement-and-plaster part of the construction will also cost less than the usual brick arches, because there is less material used and



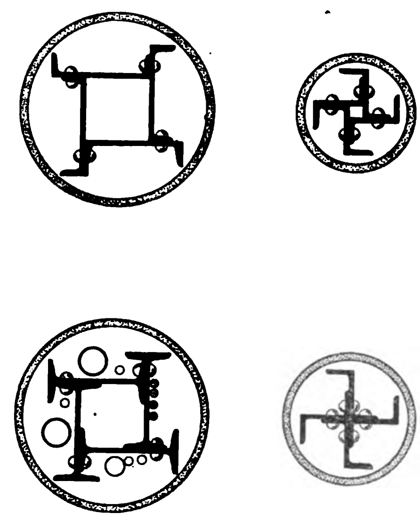
Varieties of Ceiling. The lower part of each diagram shows the Arrangement of the Ironwork: the upper part shows the same filled with Cement, with indications of the wires for supporting the upper finished surface.



Diagrams showing a few of the Forms in which the Arches may be combined.

it is of less costly nature; and, furthermore, the labor is quickly performed, as it merely consists of spreading the materials in their proper places.

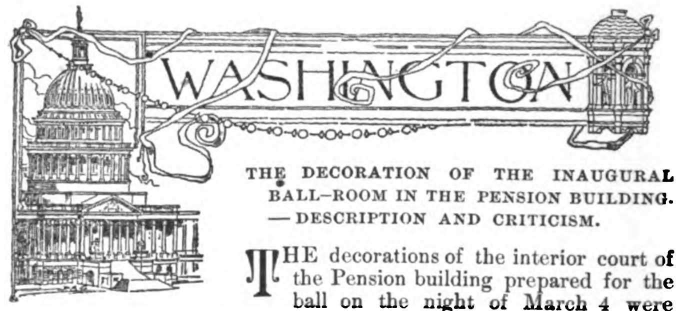
The columns are here shown. They are made of wrought-iron or steel, and are continuous from the foundation to the roof, but diminish in amount of material upwards in proportion to the loads they have to support. In starting at the foundation with a column made of four 12″ heavy beams, after one or more stories the beams can be reduced at 12″ light beams, after that to 12″, 9″ and 6″ channels. These horizontal joints are all spliced joints, so that the columns form, practically, one column from foundation to roof, thereby making the columns much stronger and stiffer with the same amount of material as would be used if a number of short columns were placed one on top of another. The continuous column is also more economical to make, as the metal can be of a uniform length and holes punched alike in each piece, so that a beam or channel cut to uniform length will fit in any column. The only place where there will be any waste is at the top of the column, where they may have to be cut to irregular lengths. This way of building a column has a great advantage, as it leaves four continuous recesses from the foundation to roof, which space can be utilized for pipes and wires. If the column is made to finish a few inches above the roof, and a removable cap put upon it, pipes and wires can be put in or removed from the recesses in the column at any time.



MR. POULSON might easily have expanded his paper, but very likely the presence in the lecture-room of models, diagrams and drawings made needless the use of more words. Still there are some things which it may be worth while to add. Although now known only as one of the leading iron-masters in the country, Mr. Poulson was educated in his native land as a bricklayer—"educated," not "trained," is the proper word to use here, for he was taught to use his intelligence quite as much as his hands. The portion of his studies that most interested him was the theory and construction of the arch, particularly groined archwork, and he thoroughly mastered its theory of distribution of strain and load as well as the practical execution of the work. Consequently when later, in this country, he became interested in iron and its application to constructive needs, he naturally sought to inquire how far the same theory could be applied to that material. One of the early applications he sought to make was in the construction of grain-elevators, which was illustrated in the *American Architect* as long ago as November 17, 1877, but, for some reason it is not easy to understand, his proposition did not find favor with the owners.

With this as a starting-point and having every facility at hand, Mr. Poulson continued his investigations and experiments until, some three or four years ago, he determined to carry them out practically in a house he built for himself at that time on the shore of Long Island. The manner in which he carried out his idea is partly shown by the view of the hall in this house, which is published in this issue. Here the method used had not reached its latest development, since the ironwork was not everywhere protected on the underside, as the feeling was that the construction was sufficiently fireproof for a dwelling where the combustible contents cannot produce many units of heat, and that it would be safe to sacrifice something of absolute safety to decorative effect. In other particulars the construction was similar to that described in the paper above, except that in certain of the rooms the upper flooring of wood was omitted, the carpets and rugs being spread directly upon the finished cement surface.

Apart from the method of constructing the skeleton of this building, it is one of the most interesting in America and has acquired a world-wide reputation through the accounts of it, incomplete and generally inaccurate, that have been published in the technical journals of many countries. As yet, a complete and reliable description of the building has not been published. About all that we know about it is that the outer walls are of eight-inch brickwork, sheathed on the outside with sheets of copper whose surface is diapered, stippled or decorated with wavy lines in such slight relief as to merely give a texture to the surface. These sheathing-sheets are produced by a galvanoplastic process, the copper being deposited upon the mould in an ordinary bath of large size. In the same way all the decorative panels, window and door finish and cornices have been prepared. The copper-work is all riveted together, not brazed, proper allowance being made for expansion and contraction. Upon the inside, the outer walls are plastered directly upon the brickwork, so that there is no air-space of any kind in the substance of the wall. This course was adopted with some misgivings, as it appeared uncertain how such a wall would behave in the matter of condensation of atmospheric moisture within the house and the transmission of heat and cold. Careful observation during two years has demonstrated that there is no ill-effect from condensation and that the temperature of the house, at all seasons, is remarkably equable. With such absolutely solid and impervious walls the housekeeper in this house is relieved from waging constant war upon vermin, big and little, and Mr. Poulson feels entirely satisfied that he has achieved a domestic as well as a constructive success.



THE DECORATION OF THE INAUGURAL BALL-ROOM IN THE PENSION BUILDING.—DESCRIPTION AND CRITICISM.

THE decorations of the interior court of the Pension building prepared for the ball on the night of March 4 were carried out with more elaboration and at a greater expense than has been the case at any of the previous inaugural balls.

The covered court of the Pension building is 116 feet wide by 316 feet long and is divided into three nearly equal parts by rows of four large columns (which have no reason for existing) one-third of the way from each end. Directly in the centre of the court is a fountain thirty feet in diameter. The court is surrounded by two Renaissance galleries modelled strictly after similar galleries in Italian palaces. A third light wrought-iron gallery without classical feeling is the topmost horizontal feature. The central portion between the eight columns reaches a height of about one hundred and fifty feet.

In decorating, the first effort was to obliterate this great height by draping the whole interior ceiling with a canopy of white and gold-colored bunting, which reduced the height to about seventy-five or eighty feet. It will give an idea of the magnitude of this canopy to say that 10,000 yards of material and 35,000 feet of rope were used in putting it in place.

The galleries forming the features for the principal horizontal decorative effects were utilized on the second floor by draping the tiers with lambrequins of silk-plush embossed with gold, studded with groups of ancient armor. The lambrequins alternated with draped American-flag trophies and the names of the Presidents in electric lights.

The face of the balustrade was covered with shields containing the coats-of-arms of the different States, surmounted by gilded eagles and with silk American flags, over a draped red-bunting background, outlined by green garlands and trailing vines. The pedestals of the balustrade were capped with vases filled with growing palms interspersed with electric-light effects.

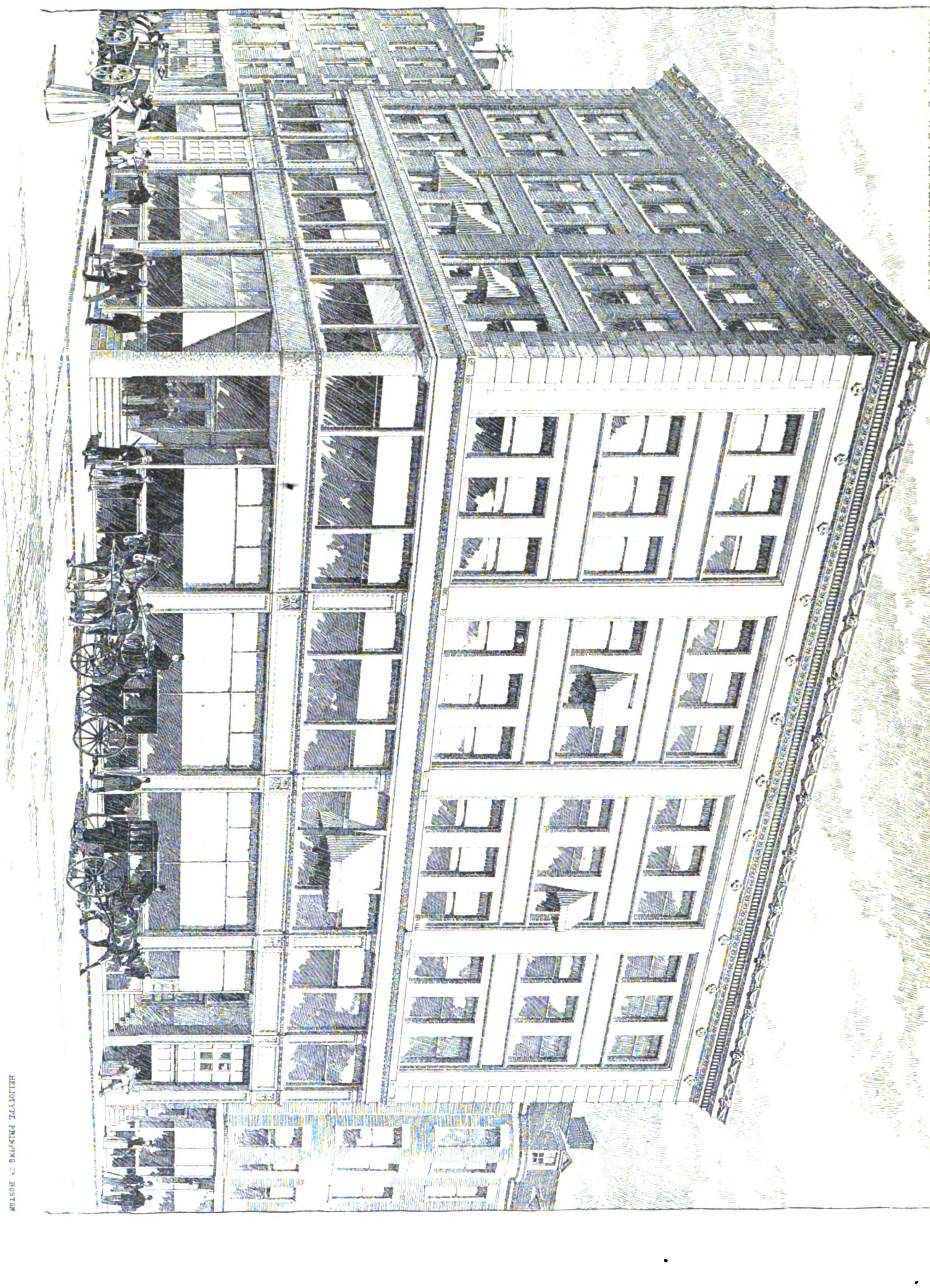
The fourth-story balcony carried the only foreign flags used in the decoration of the court. Here groups of all or each nation were draped alternately with groups of the United States flags.

The wall back of the gallery-arches, the normal tone of which is cream-color, was treated with festooned white-and-red bunting, below which were rich blue-silk banners, with coats-of-arms of the various States embroidered in gold. These banners were imported for the occasion.

The central space in the hall, which is bounded by the four columns east and west and the two band-stands north and south, is where the most elaborate effects were aimed at and attained. In the centre is the fountain, thirty feet in diameter, sixteen feet high, with four basins, the whole bedded with plants, trailing vines and vases around edges filled with blooming flowers.

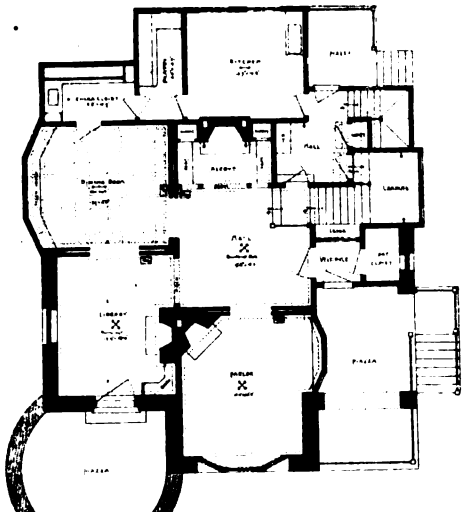
The eight large Corinthian columns, sixty feet high, four east and four west of the centre, connected by small semicircular arches, trivial in comparison to the magnitude of the columns, were treated about the base with large vase-shaped decorations of deep-garnet and gold, from which rose palms, potted plants and flowers interspersed with which were electric flowers, lilies-of-the-valley, revolving stars and kaleidoscopic electrical effects. Just above the vases were trophies composed of shields, draped flags and the names of all the Presidents of the United States. The shafts of the columns, from cap to base, were covered with wild smilax-vine.

North and south of the centre were the raised platforms for string and promenade bands. Back of the platforms and just in front of the galleries rose triumphal arches thirty feet wide and forty-five feet high, draped with solid white bunting, gathered to simulate the architectural members of a classical entablature. The white formed a background for a delicate tracery of asparagus-vines. All the ledges



BUILDING COR KINGSTON AND ESSEX STS BOSTON MASS.
WINSLOW & WETHERELL, ARCHITECTS

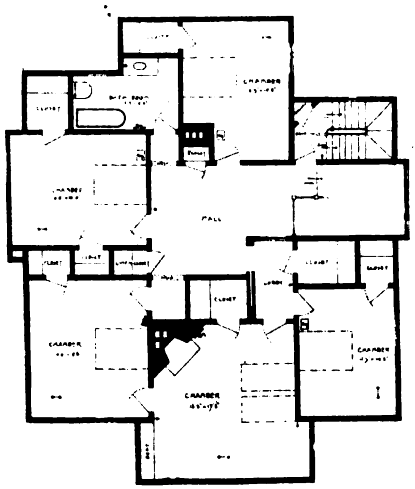
HELIOTYPE PRINTING CO BOSTON



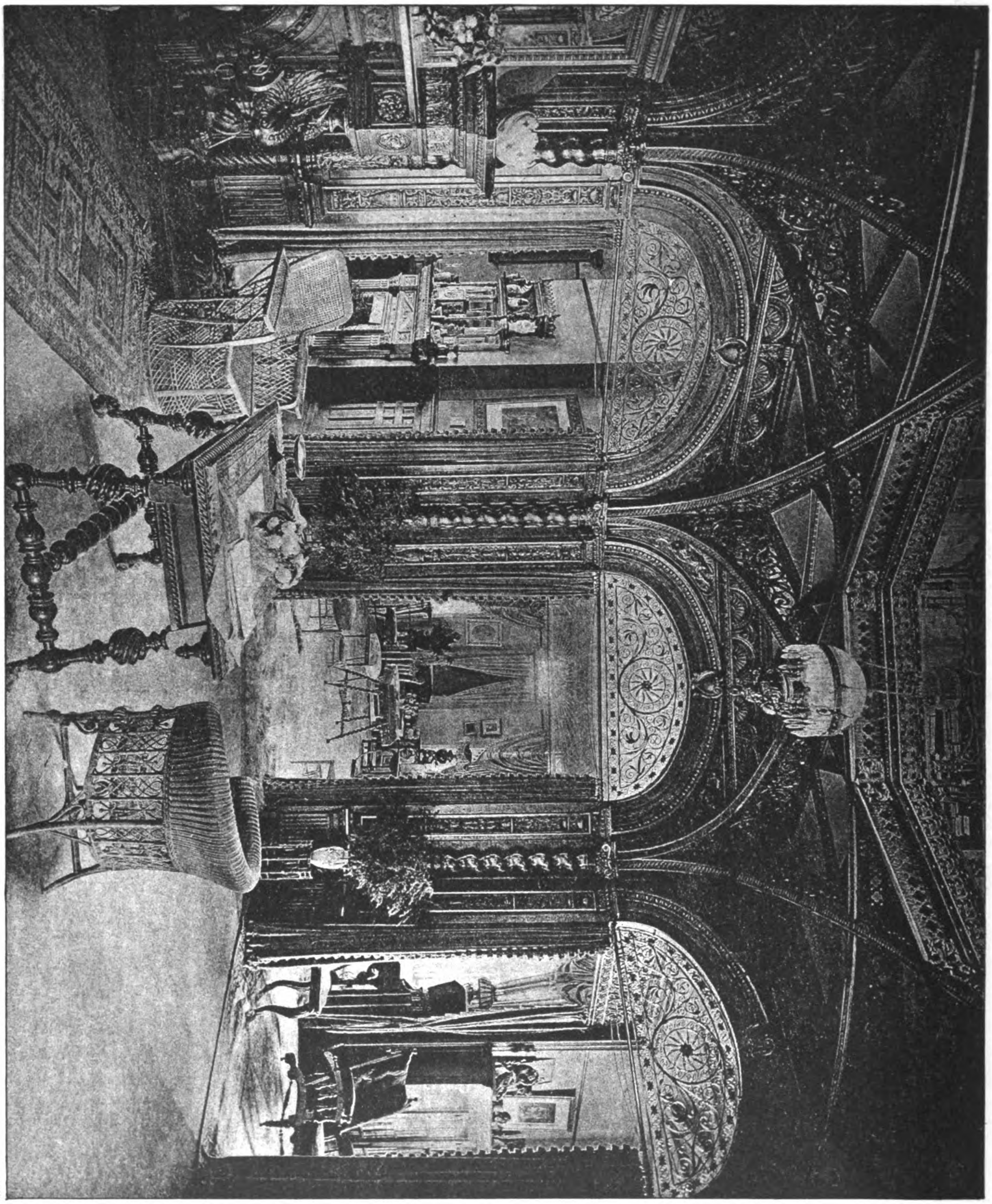
First Floor Plan

HOUSE ON LANARK ROAD.

EDWARD LITTLE ROGERS,
Architect and Owner.



Second Floor Plan



HALL IN HOUSE OF N. POULSON, LONG ISLAND, N.Y

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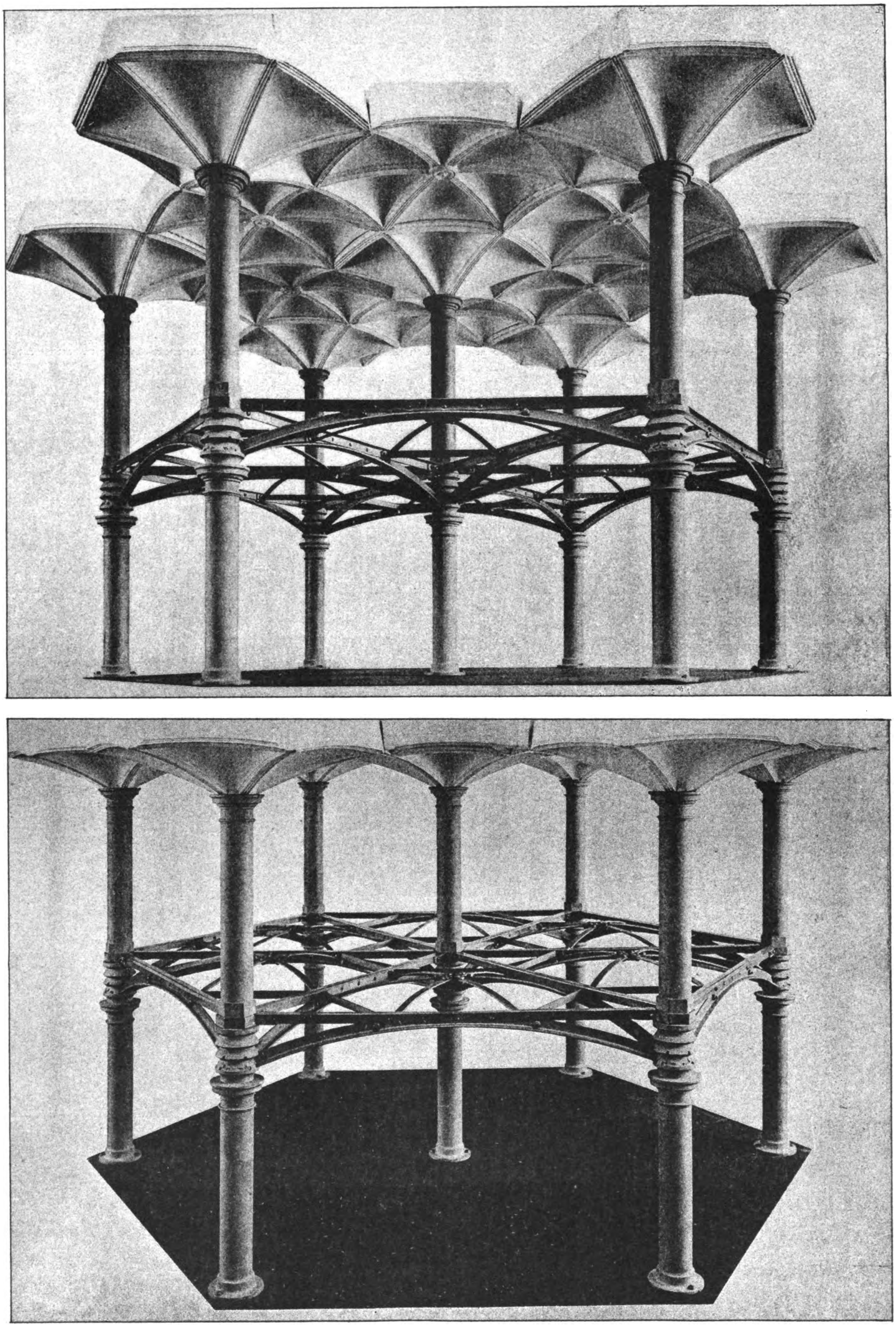

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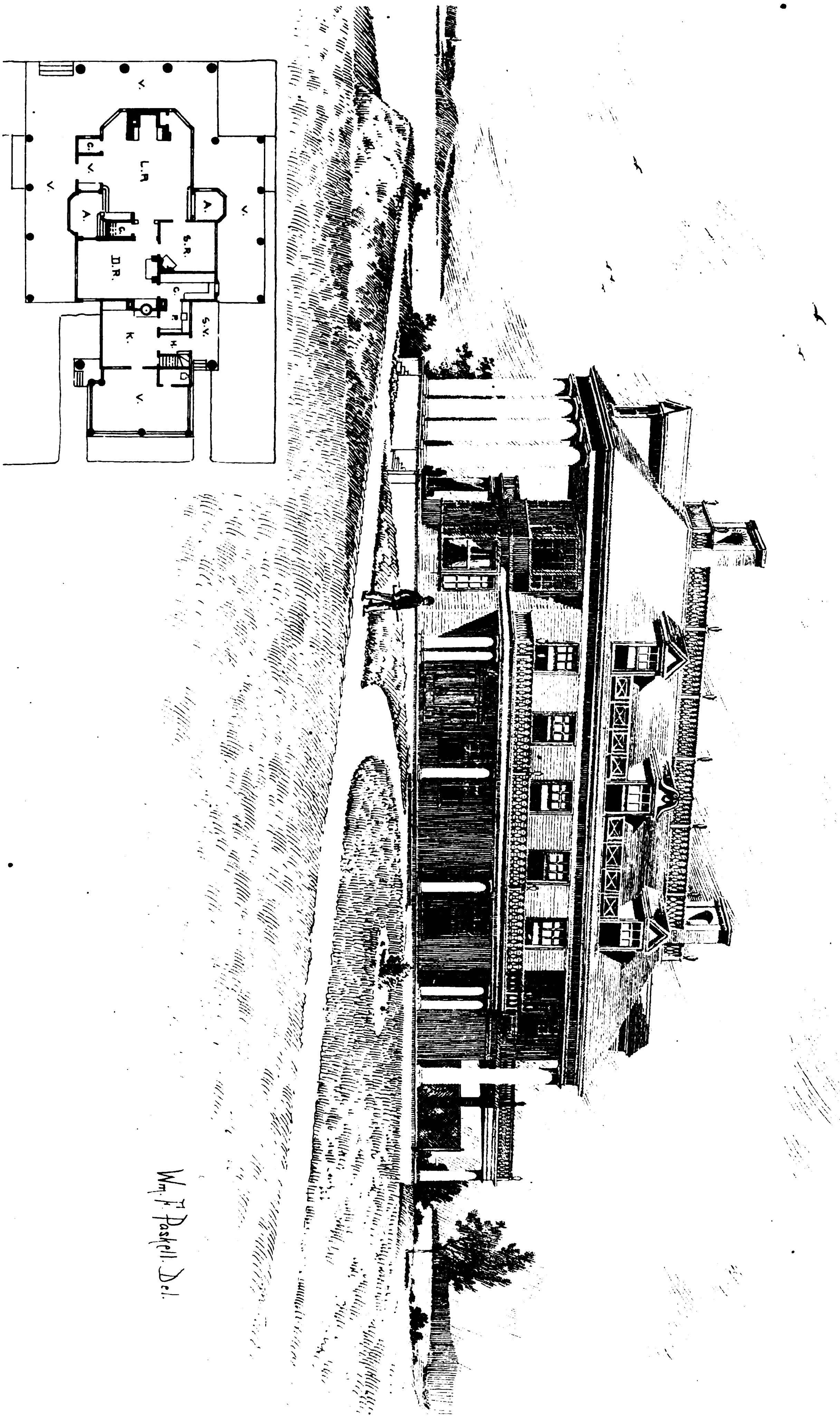
MODEL SHOWING FIRE PROOF CONSTRUCTION DEVISED BY N. POULSON.



RESIDENCE · FOR · A · SCHWARZMANN · ESQ ·
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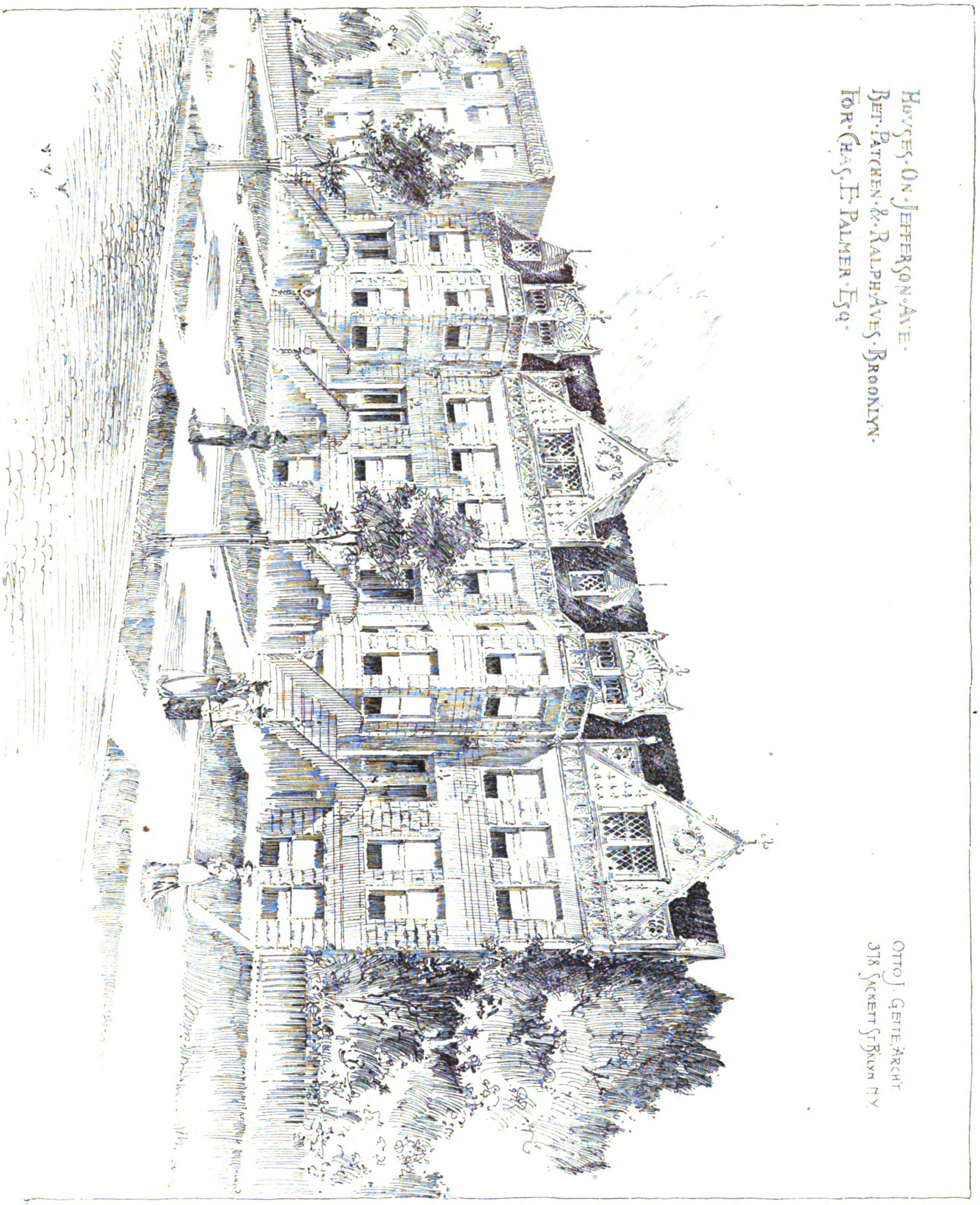
WAIT · AND · CUTTER · ARCH'TS · BOSTON ·


Houses on Jefferson Ave. Bet. Patchen & Ralph Aves. Brooklyn. For Chas. E. Palmer Esq.
Otto J. Gette Arch't 378 Sackett St. B'klyn N.Y.

were covered with laurel, intended to convey the effect of growing vines upon any surface where earth might find a lodgement.

Over the arches themselves in electric lights were the words, on the north side, "Cleveland" on the south side "Stevenson."

Surrounding the interior court on the first floor was the dining-room simply decorated with bunting and flags. On the second story was the diplomats' reception-room, decorated with stands of United States colors and foreign flags. The room at the end of the corridor leading to the President's reception-room contained a miniature representation of the United States Capitol, terrace and all, twenty-five feet long, twelve feet high, seventeen feet wide, of white immortelles placed in front of a Nile-green background and under a white canopy with vine tracery.

The President's room was in the southeast corner (the room occupied by Commissioner Raum). The walls were covered with soft white bunting draped artistically and forming a background for an elaborate display of vines, orchids, Marechal-Neil and other fine roses, azalias, genestas, banks of maiden-hair ferns and other beautiful flowers. On the wall was the President's flag, consisting of a blue field and the United States coat-of-arms.

The decorative work was done by Koster of New York and the flower exhibit by J. H. Small of Washington. The committee in charge of decoration consisted of two architects and one artist, besides several business men.

The influence of the artistic element on the committee certainly had its effect, as all who have attended this and previous inaugural balls acknowledge the decorations to have been in better taste, more effective — a decided advance in the treatment of temporary decorations.

The usual method has been to use ropes of green, twisted snake-like around columns and hanging chain-like along balconies, assisted by long ribbons pendent radially from special points in the roof, suggesting pictures of the old May-pole and its streamers. In the present instance no ropes or streamers were used, the green was massed on the eight columns, or used as trimming or trailing vines, an effort evidently having been made to have them appear as if in natural position. The colors had a more massed effect than has been usual and the simple white triumphal arches (band-stands) with their green trimmings were very pleasing in their color effect. One of the best features of the decoration was the canopy ceiling, which was peculiarly appropriate in this case as a means of lowering the ceiling, hiding the plain iron trusses and the enormous void or open space in the centre of the building.

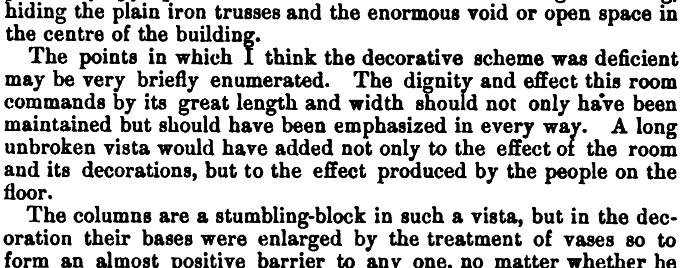
The points in which I think the decorative scheme was deficient may be very briefly enumerated. The dignity and effect this room commands by its great length and width should not only have been maintained but should have been emphasized in every way. A long unbroken vista would have added not only to the effect of the room and its decorations, but to the effect produced by the people on the floor.

The columns are a stumbling-block in such a vista, but in the decoration their bases were enlarged by the treatment of vases so to form an almost positive barrier to any one, no matter whether he were on the floor or in the galleries, trying to get a glimpse of more than a third of the floor at one time, and from the floor the same treatment prevented the taking-in anything but a contracted view of the gallery-decoration. The effect was further contracted by the band-stands, which projected so far out into the court that they practically divided the central portion into two parts. So in this room, magnificently proportioned in length and breadth, we find only four rather small spaces instead of one imposing and effective whole.

This arrangement must have interfered materially with the practical side of the show, *i. e.*, dancing and promenading, as well as with the striking effect which it was desirable to attain.

The method of using flags, and these being, to a certain extent, limited, was an improvement on former practices; but I think in this large building that there was still a lack of massing in colors, in effects and in flowers, which would have added to the dignity, repose and harmony of the decoration. The Capitol modelled in immortelles was a very interesting piece of work in itself, as it was a very accurate miniature of the Capitol, columns, dome, porches, terraces and all.

The decorations in the President's room were dainty and pleasing, in every way suitable to their temporary character and to the occasion.



THE GARBAGE NUISANCE.— NEW FORM OF BUILDING PERMIT.— THE NEW BUILDING ORDINANCE. — FALL OF A RUINED WALL. — FALL OF A PARTLY-FINISHED BUILDING. — ACCEPTED CONTRIBUTIONS TO THE WORLD'S FAIR ARCHITECTURAL EXHIBIT.

OUR city at no time is noted for its cleanliness, but this spring it seems as if its streets and alleys quite excelled their usual selves. The horrible garbage-boxes, often placed, in accordance with the letter of the law, immediately in front of the houses to which no alley belongs, are simply overflowing. One longs to have for a few weeks the absolute power of a Roman emperor of "the good days of old," combined with that desire for "prison neatness" of the notable New England housekeeper. All this dirt and disorder is, of course, in part a natural result of the two months' of uninterrupted icy weather, which have made the usual amount of cleaning impossible. Still this does not excuse the condition of the garbage-boxes, and the man who will have an inspiration concerning their contents ought to be made the patron-saint of the city. What avails fine buildings and beautiful streets if, with ever so slight a turn of the eye, the ever-present orts-collection greets you. There is no excuse for the present method used for collecting garbage, and the men who helped to establish these filthy receptacles on the streets should have their names inscribed in blushing letters on the sides of them.

And as if people could not be satisfied with all this dirt on the streets, a movement has been set on foot lately to offset the good which is being accomplished by the Society for the Prevention of Smoke. Fortunately, this attempt has been but indifferently successful, and only a few of our rich men are guilty of having their names appear among the champions of bituminous coal.

The Board of Public Works has quite properly taken a stand in regard to the monopoly of the streets for building-purposes. Those applying for permits during the last two weeks have been confronted by a new set of rules framed by this department. They are as follows:

"The street in front of said premises shall at all times be kept free from obstacles to safe and convenient public traffic, and not more than eight feet from the curb-lines be occupied at any one time. The permanent storage of building-material on the street will not be admitted.

"The party to whom this permit is granted shall construct and maintain, or cause to be maintained, at his own expense, during the whole term for which the same is granted, a good and substantial sidewalk, and in case a permit is granted to excavate under the sidewalk space such work will be done with as much expediency as possible and the sidewalk replaced without delay.

"Stone-cutting and stone-dressing on the street is hereby prohibited.

"No dirt, rubbish or débris of any kind shall be deposited on the street except for immediate removal.

"Only such material for the construction or repair of buildings as will be used from day to day will be permitted to be placed on the street or sidewalk, and débris of every kind must be removed at once.

"Sand, lime, mortar, boxes, etc., will not be permitted on the street.

"Posts for attaching guy-ropes for derricks and for other purposes in connection with said building-operations may be erected at either curb-line of the street, within the frontage limits of said premises. Said posts shall be ample in strength and of suitable material; provided, however, said post shall not be less than eight inches square, sixteen feet long, and set at least four feet in the ground. Said guy-ropes attached to said posts shall be maintained in such position that no part thereof shall be within twelve feet of the surface of the street, and such guy posts, derricks, etc., shall be removed, at the expiration of this permit, or before if so ordered, from the front of said premises, and the street left in as good condition as found at the commencement of the work.

"All excavations or other dangerous places existing on account of said building-operation shall be securely barricaded through the day and red signal-lights shall be displayed during the night; the same precaution shall be taken to guard against accidents from stone, lumber, or any other material deposited on the street.

"This permit is issued conditionally that all materials and obstructions shall be removed from the street within six hours after notice is served.

"The party to whom this permit is issued takes and accepts this permit subject to these conditions and all liabilities, terms and conditions of a bond given for the purpose of obtaining the permit.

"The foregoing requirements and all ordinances and orders of the city bearing upon the subject shall be performed to the satisfaction of the Commissioner of Public Works, who reserves the right to revoke this permit for any violation of or neglect to observe the conditions herein prescribed, and the party to whom this permit is issued hereby expressly agrees that the expense due to any failure on his part to observe the requirements of said permit shall be paid out of any money deposited in advance for such purposes, and that the balance, if any, shall, upon the return and cancellation of this permit, be refunded by the Commissioner of Public Works."

A schedule of bonds accompanies these rules, the largest bond being required for buildings to be erected in the crowded down-town districts.

It is interesting to notice that for the first time, in at least Western architectural history — and most probably it is true all over the United States — has the local Chapter of the American Institute of Architects been recognized by the municipal powers as the authorized representatives of the profession. It is, of course, a step in the right direction towards a certain dignified recognition of the profession as an established force in the community, which would not have been possible, in this part of the country at least, ten years ago. This recognition comes from the action of the city fathers in making the president of the Illinois Chapter of the American Institute of Architects an *ex-officio* member of the Department of Buildings. The president shall be one of the members to conduct the examination of candidates for building-inspector, as well as serve as a juror on a committee when, in case of dispute, arbitration is necessary. There has several times been mentioned in these letters the plan for the new building ordinance, which for thirteen months has been in

the hands of a special committee of several of the aldermen and citizens, both architects and unprofessional men. This ordinance has at last been passed over the mayor's veto. The chief struggle has arisen over the limit to the height of buildings, those men wishing to centre the business interests within a few down-town blocks advocating the most extreme proportions for the sky-scraper, while those wishing to extend the business centre being strenuously in favor of placing the limit at one hundred and thirty feet, or ten stories. The original ordinance placed the limit of height at one hundred and sixty feet, while the one-hundred-and-thirty-foot limit was introduced as an amendment. The ordinance as at last passed establishes a department of the city government, to be known as the Department of Buildings, embracing a commissioner, a deputy commissioner, a secretary and such inspectors and other officers as the City Council may provide. The commissioner is required to be an experienced architect, civil-engineer or builder, is to be appointed by the mayor, and hold office for two years. He is given the power of inspection over elevators, fire-escapes and all classes of buildings. The inspectors are required to be skilled laborers, and, before their appointment, are required to pass an examination before a committee consisting of one member each from the Building and Traders' Exchange, Building Trades' Council, Underwriters' Association and Illinois Chapter of the American Institute of Architects. The commissioner and inspectors are empowered to enter all buildings for the purpose of ascertaining whether the ordinance has been complied with, and, in case the Department decides against the security of any building being erected, the interested parties have a chance to appeal to the Committee on Arbitration. The commissioner is given the power to order the demolishment of any building or part of building, while an appeal to the Arbitration Board is allowed. Of course, the ordinance contains specifications in detail regarding foundations, thickness of walls, etc. Concerning walls damaged by fire or explosion, the commissioner's decision is final, and no appeal to the Arbitration Board is permitted. This part of the ordinance gave rise to violent discussion. In view of the events of the last month, it would look like a wise precautionary measure to vest the commissioner with absolute power as far as the removal of ruined walls is concerned.

Unfortunately, in this month, in the report we have to make, we have to deal not so much with structures that have been put up as those that have come down. Two more edifices have fallen in our city, causing loss of life and property. Last January, a structure known as the York Building was burned, entailing considerable loss on the owner, and at the time of the fire an additional loss on the surrounding property-owners by falling walls. The ruined walls had been allowed to stand, till, finally, at the beginning of this month, during a severe wind-storm, they fell, crushing out of existence two buildings and their occupants. With this dreadful accident before us, the question "Who was to blame?" has been fresh in every one's thoughts, and the coroner's inquest has been thorough and searching. As a result, the coroner's jury recommended that the City Building Commissioner, the contractor, the architect and the owner all be held to await the action of the grand jury. It seems to be a case where every one's business was nobody's, and a frightful accident has been the result. The idea was to utilize the old walls in rebuilding, a permit having been obtained the very day of the accident. Perhaps the blame has been unjustly laid on four innocent people, but it is high time that it should be made somebody's especial duty to attend to walls made unsafe by fire. That any one of these men was responsible singly for the disaster seems hard to prove, but their combined power must have been sufficient to have hastened the work of demolishing the walls, had it been considered desirable to do so.

Reports as to their safety were of course very conflicting at the inquest. The commissioner says he was legally advised not to touch the walls, as being, by their condition, quite out of his jurisdiction. The owner says he knew nothing about it anyway, and left it to the commissioner, the insurance-adjuster and the architect. The architect says that had the work been pushed on before the occurrence of the severe gale this particular wall with surrounding supports would have been quite safe. The insurance-man says, airily, he had but little to do with the case. At least, however, he considered the north wall so uninjured that he was not willing to allow any damage on it. It simply reduces itself to a matter of dollars and cents. First, the insurance companies, with the spirit which usually characterizes their actions, refused to allow any damage on a wall that was still standing and might possibly be looked upon as safe enough to incorporate into a new building; second, the Building Commissioner, though repeatedly warned by both interested and disinterested parties that the wall was unsafe, though his own knowledge on such subjects must have been sufficient to have made him aware of the fact, was afraid to order it down for fear of a lawsuit on the part of the insurance companies; third, the owner clung to the wall in the hope that he could save himself the expense of a new one, and, fourth, the architect, evidently apprehensive that his client might turn the work over to some less honest architect than himself, failed to insist, as of course he must have known, that this old and perfectly insecure wall, weakened by fire and frost, was not fit to be incorporated into a new building. That a few hundred dollars might be saved to certain individuals, it was considered desirable to risk the safety of this ruin, which, finally, falling, wrought more financial loss than would have been the cost of itself, and crushed out of existence seven innocent beings, men, women and little children, sleeping in their own beds and homes. What especial responsibility the contractor has is scarcely perceptible, but the underwriter, Building Commissioner, architect and owner must have consciences hardened to a most comfortable condition to have been able to allow the matter, as one of them says, to have "passed from his mind." The Chief of the Fire Department seems to be the only man who dares tell the truth at such times, and he, as usual, warned the Building Department that the wall was unsafe. Probably the position of Fire Marshal, as being one surrounded by danger, is not so sought after that the man who fills it need be afraid of making himself unpopular.

Crowding on the heels of this accident comes a much less serious one in the partial collapse of a partly-finished store and flat building on the corner of 65th and State Streets. There workmen were injured and a considerable damage was done to the property. It was one of those buildings with the much-admired corner-turret, and when the crash came it was this corner portion, a section twenty-five feet square, which, with no warning, entirely gave way. The accident is attributed to the defective foundation under the corner pillars. It has been suggested that the foundation became insecure because of sewer-excavations under the portion on which rested the supporting-columns. It has been reported that the sewer-excavations went three feet lower than they should, and the result was the weakening of one of the chief supports of the corner structure. This may or may not have been the case. It is one of the very numerous buildings which has been rushed-up in cold weather, and in all probability the workmanship was not what it should be. A noticeable example has just been given by a West Side contractor who of his own accord has decided to take down an unsafe, frost-heaved brick wall, which undertaking will mean to him a loss of perhaps a thousand dollars. It is to be hoped that the one thousand dollars honestly spent will be a good investment for him.

In view of these accidents, the authorities have notified the officers of the Calumet Club that the ruined walls of their club-house are unsafe and must be pulled down. Neighbors have been warned and the Board of Directors of the Club has drawn up letters asking Superintendent McClaughy and Chief Sweeny to take steps to protect the public. In the meantime one of the building-inspectors says if the building is condemned the city is liable to be sued by the insurance companies.

Chief Sweeny of the Fire Department has also within the last few days sent in a notification to the effect that a temporary structure which is to go by the name of the Hotel Columbia, and is to be used for the accommodation of World's Fair guests, is being erected on entirely false principles, and is certainly insecure. It remains to be seen what action the Building Department will now take in this matter.

It is a relief to turn from these discouraging features in connection with the building interests of our city to the work which is being done in the Art Department of the World's Fair in passing judgment by the jury upon the works of Western artists. Out of nine hundred and ninety-seven works, one hundred and forty-six were accepted, fifty-seven belonging to Chicago artists. The jury was a representative body of American artists, selected from different parts of the country. Three different juries have in charge the works in painting, sculpture and architecture, each jury presiding over its special branch. Of sixty-three architectural studies submitted, twenty were accepted. These were as follows:

Alfred L. Evans, Chicago, fountain to commemorate discovery of America; Gilbert & Taylor, St. Paul, cottage, Manitou Island, Balcony of the Endicott Building, Little Church, St. Paul; Holabird & Roche, Chicago, residence, Grand Rapids, old country building, water-tower, Fort Sheridan; Hash & Plympton, Cincinnati, Cincinnati Crematory; Residence of Mrs. C. A. Plympton; O. C. Rixon, Chicago, Design for suburban residence, general plan, longitudinal section, front elevation, side elevation; Shepley, Rutan & Coolidge, Chicago, Ames Building, Boston, Art Institute, Chicago; Walker & Kimball, Boston and Omaha, residence, Lincoln, Nebraska, main façade Omaha Telegraph Exchange, McCague Building, Omaha, main façade Omaha Public Library; T. O. Frankel, Chicago, a Mountain Home.

The architectural jury consisted of Cass Gilbert of St. Paul, W. S. Eames of St. Louis and D. Adler, S. S. Beman and C. B. Atwood, all of Chicago. It seems a pity that a different kind of exhibition could not have occurred at this time. These twenty studies are doubtless, as to character, a fair sample of what will follow; — pen-and-ink and water-color perspectives of different buildings which will doubtless have some small attraction for the general public. But a set of working-drawings, even if soiled and torn with handling and on the commonest manila-paper, say of one of our great buildings, would be worth double anything of the sort to members of the profession visiting the Fair. Not, of course, that these in themselves would be attractive and beautiful, but of course if such a great fair means anything, its educational feature is one of its strongest points.

COMPARATIVE MUNICIPAL BUILDING LAWS.—XXIV.

[*Note*:—In these tables bracketed letters invariably refer to preceding passages in the same column.]

Fire-Escapes and Stand-Pipes.

Boston:—*a*. *Every building hereafter built, and every building occupied by more than one family*, shall have, with reference to height, condition, construction, surroundings, character of occupation and number of occupants, one or more safe means of egress in case of fire.

b. *School-houses more than one story high, churches, theatres, public buildings, halls, places of assembly and resort, buildings occupied above second story by two or more families, or as tenements, factory or workshop where ten or more persons are employed*, shall have at least two independent ways of egress, each accessible from each apartment—one inclosed in brick walls with no interior openings other than doors of apartments for exit, and provided with ventilating skylight operated from lower hall.

c. Ways of egress kept in good repair, without obstruction. Stairway built to meet these requirements may project, by special permit, over public way.

d. Platform, landings and stairway steps of fire-escape strong enough to carry load of seventy pounds per square foot, besides weight of material.

e. Owner or lessee, tenant or person employed in building, or, for public school, any citizen, is entitled to possession on exhibition of certificate of safety issued by Inspector.

Baltimore:—*f*. *Dwelling-house more than two stories high, occupied or built to be occupied by more than one family on any floor above the first; building more than two stories high occupied or built to be occupied as hotel, boarding or lodging house, factory, mill, office, manufactory or workshop in which are operatives in any story above first*,

g. Shall be provided with such fire-escapes, alarms and doors as directed and approved by Inspector.

h. Fire-escapes kept in good repair, and painted, and without obstruction.

Brooklyn:—(*f*) and *i*. *Any dwelling more than two stories high, occupied or built to be occupied by three or more families above first story*, shall be provided with such fire-escapes and doors as shall be directed and approved by Commissioner. (*h*).

Charleston:—

Chicago:—*j*. *Buildings, except those used exclusively for private residences, more than three stories high*, shall be provided with one or more metallic ladders or metallic fire-escapes, extending from first story to upper stories and above roof, on outer walls, in location, number, material and construction determined from time to time by *k*. Commissioner and Fire Marshal.

Buildings over two stories high used for manufacture of combustible articles or material, wherein more than two hundred employés are employed, shall have at least two egress stairways at least 50′ apart.

l. *Buildings more than two stories high used for manufacturing purposes* shall have one metallic ladder for every twenty-five persons or less employed above second story. Every structure where one or more persons are employed for wages above first story shall be provided with a good fireproof stairway for each 25′ frontage of such structure.

Cincinnati:—*m*. *Buildings, except those used exclusively for private residences, more than two stories high*, shall be provided with one or more suitable fire-escapes extending from first story to upper stories, and above roof on outer walls, of location, number, material and construction determined by Inspector.

(*n*. Or by "fire-escape and smoke inspector," if such is designated by Mayor.)

o. *Buildings more than two stories high used for manufacturing purposes* shall have one suitable fire-escape or fireproof stairway for every twenty-five persons or less employed above second story.

p. *Any structure where one or more persons are employed as workmen or workwomen* for wages in trade or occupation shall be provided with sufficient fire-escapes, doors and stairways for escape of employés in case of fire or accident.

Cleveland:—(*m*); (*o*); (*p*).

Denver:—*q*. *Buildings occupied above second floor above level of street, and*

r. *Buildings more than two stories high, occupied in whole or part as tenement, boarding or lodging house, factory, mill, manufactory, offices or workshop in which persons are employed, or as school*, shall be provided with one or more metallic ladders and fire-escapes extending from first story to upper stories and above roof, and with platforms in connection therewith at each story above first floor; fire-escape or ladder securely fastened to outer wall, and constructed of material and in manner from time to time determined by Board of Fire Commissioners.

Detroit:—

District of Columbia:—*Buildings constructed or used as hotel, factory, manufactory, theatre, tenement-house, seminary, college, academy, hospital, asylum, hall, place of amusement, more than 50′ high*, shall have affixed iron fire-escapes and combined stand-pipes and ladders, or either, as approved and adopted by Commissioners of District.

Kansas City:—(*q*) by more than one family, and *buildings occupied as tenements, boarding or lodging house, factory, mill or manufactory, offices, workshop, mercantile or other establishment, in which persons are employed above second floor, and schools more than two stories high*, shall be provided with suitable facilities for escape in case of fire, kept in good repair, sufficient for safe egress, in case of fire, of all persons usually employed in or frequenting building.

Fire-escapes authorized by Superintendent on outside of building must not be erected opposite or in front of windows, but

r. May project over highway, and shall have suitable connections with ground and with railed landings at each story above first, and connected with each story by doors or windows, and kept without obstruction.

Louisville:—(*m*), with advice of Fire Chief from time to time. Stairways in *factories, mills or warehouses more than three stories high, and more than* 3,000 *square feet area*, shall be fireproof.

Buildings more than two stories high used for manufacturing purposes shall have one metallic ladder for every twenty-five persons employed above second story.

Any structure where person or persons are employed shall be provided with sufficient doors, stairways, iron ladder escapes placed on outer walls; and *where persons are employed above first story*, there shall be a fireproof stairway to each 25′ frontage of building.

aa. *Buildings over two stories high used for manufacture of combustible articles, and wherein more than one hundred employés are kept at a time, shall have at least two egress stairways, fireproof, and at least 50′ apart.*

Memphis:—*Buildings more than two stories high, occupied or built to be occupied by more than two families above first floor, or as hotel, lodging or boarding house having more than fifteen rooms, and*

s. *Every factory, mill, office-building, manufactory, workshop, hospital, asylum or institution for care or treatment of individuals, buildings used in whole or part as school or place of assembly*, shall be provided with good and sufficient fire-escapes or other means of egress, in case of fire, as directed by (*h*).

t. Inspector.

Theatres, etc.: *u*. There shall be balconies not less than 4′ wide in open space (see "*Construction of Theatres*") or spaces at each level or tier above parquet on each side of auditorium of sufficient length to embrace two exits, and from balconies staircases extending to ground level; maximum riser, 8½″, maximum tread, 9″.

v. Staircase from upper balcony to next below and from first balcony to ground not less than 4′ clear.

w. All balconies and stairs, including floors, of iron throughout and of ample strength.

x. Where one side of building borders on street there shall be balconies of like capacity, with stairways carried to ground, all constructed of fireproof material and approved by Inspector.

Milwaukee:—(*p*) *Buildings more than two stories high not exclusively used for private residences, designated by Inspector, Chief of Fire Department and Board of Public Works*, shall be provided with one or more metallic ladders or metallic fire-escapes extending from first story to upper story and above roof on outer wall, in location, number, material and construction as determined by Inspector, Chief of Fire Department and Board of Public Works; such ladders or fire-escapes to be convenient of access from interior building, with balcony or other safe and convenient resting-place on level with floor of each story.

Minneapolis:—*Places of amusement and instruction*. (*u*).

y. Staircase from upper balcony to next below width not less than 30″ clear, and from first balcony to ground not less than 4′ clear. (*w*); (*x*).

Nashville:—*Buildings where any story above second is used specially and distinctly as hotel, tavern, factory, tenement, school, academy, place of general meeting, or for theatrical or operatic representation*, shall have escapes attached.

Buildings in which persons sleep, work or live above second story not classed above, and houses of general meeting or for theatrical and operatic performances, even in second story only, when Commissioners shall determine, upon inspection, that means of egress are not reasonably sufficient for occupants to escape in case of fire, they shall order fire-escapes attached to building, all fire-escapes subject to approval of Commissioner as to number, location and construction.

Newark:—

New Orleans:—

New York:—*Dwelling-houses more than two stories high, occupied or built to be occupied by more than one family on any floor above first, and buildings more than four stories high, occupied or built to be occupied by more than two families above first floor, and buildings more than three stories high, used as hotel, lodging or boarding house, having more than fifteen rooms*, and (*s*) Superintendent of Buildings.

(*h*); (*u*); (*y*); (*w*); (*x*) (i. e., Superintendent).

Omaha:—(*j*) by Superintendent and Chief of Fire Department. (*l*); (*h*).

Buildings occupied above second floor from level of street by more than one family, and boarding and lodging house, factory, mill, manufactory, offices, workshops in which persons are employed above second floor, school-buildings more than two stories high, and accommodating forty or more persons, shall be provided with facilities for escape approved by Superintendent and Fire Chief.

Fire-escapes on outside of building shall have suitable connection with ground.

Stairs on outside of building when ordered by Superintendent. (*r*).

Buildings in which operatives are employed above second story shall be provided with fire-escapes approved by Superintendent and Fire Chief.

Women and children shall not be employed above second story unless two or more exits are provided.

Public halls (*u*), but length not limited (*y*). All to be constructed of fireproof material approved by Superintendent.

Public halls accommodating 1,000 *or more* shall have at least one fire-escape and stand-pipe in street or alley outside building from ground to roof, with hose attachments close to window or door at each floor or gallery.

Philadelphia:—

Pittsburgh:—

Providence:—*Buildings in which twenty-five or more operatives are employed in any stories above second* shall be provided with proper and sufficient, strong and durable, metallic fire-escape or stairways, constructed as required in this act, unless exempted by Inspector. (*h*), (*aa*), or, if that distance is not practicable, have stairway at each end.

St. Louis:—*Buildings used or intended to be used as hotel, factory, manufactory, theatre, tenement-house, seminary, college, academy, hospital, asylum, place of amusement, 40′ or more high*, shall have iron fire-escapes and combined stand-pipes and ladders, of pattern approved by Commissioner of Public Buildings, who may designate location and give certificate of approval.

Within sixty days after notice from Commissioner, *buildings used as place of public resort, factories more than two stories high employing thirty or more persons, office, store and business buildings wherein more than fourteen are employed above second floor, school, asylum and hospital buildings, tenement buildings more than two stories high occupied by more than ten families*, shall have built on exterior front and sides, when practicable, permanent and substantial iron balconies at each and every floor 10′ or more above sidewalk level, with iron stairs at each end leading from one balcony to the other.

Hotels, public boarding and lodging houses over three stories high shall be provided with permanent iron balconies with iron steps leading from one balcony to the other at ends of halls above first story, or at such other practical places, and of number, location and construction as Commissioner of Public Works may direct. He may dispense with balconies if he thinks other means of escape to be ample.

San Francisco:—*Buildings three or more stories high used as hotel, boarding or lodging house, any factory, mill, manufactory or workshop*, shall be provided with good and sufficient means of egress in case of fire.

Buildings in which operatives are employed above first story shall have metal fire-escapes.

Fire-escapes shall be kept unobstructed, and extend from first story to four feet above roof.

Women and children shall not be employed above second floor of any factory, shop or printing-office unless there is more than one means of exit.

Wilmington:—

Compiled by HENRY A. PHILLIPS.

MOREAU-VAUTHIER.

Lid of a XIV Century Casket.

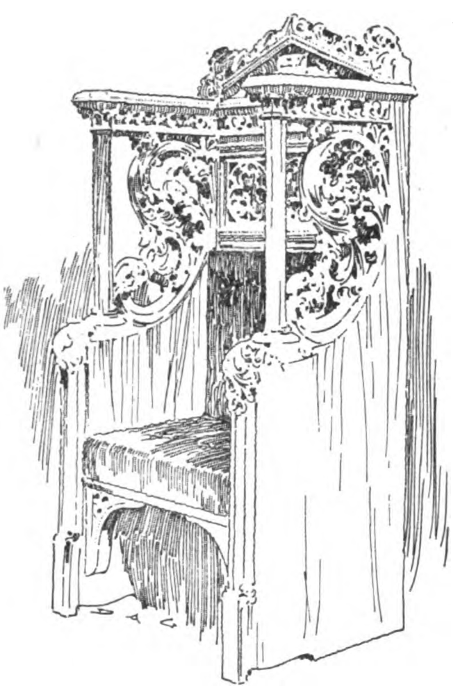
WITHIN a few weeks France has lost three of her most distinguished artists — Gauvin, Galland, and now Moreau-Vauthier, the sculptor. Galland was one of the first, if not absolutely the first, of decorative painters; Vauthier was certainly as great at decorative sculpture. He began life in the workshop of an ivory-carver, his own father. Here he became familiar with that substance and perhaps instinctively drank in a desire which he carried out later on, that of reproducing the chryselephantine sculpture of the Greeks. But his first medal, gained when he was only twenty-four years of age, was for a coffer, and a richly decorated Gothic altar. Guided by Toussaint, Vauthier became an ornamental sculptor—an *ornemaniste* pure and simple. The churches of St. Bernard and St. Joseph, the Hôtel de Ville and the Tuileries were

the scenes of his early efforts; at the "Union Centrale" exhibitions multitudes of casts of his works have been on view from time to time, side by side with decorative panels by Galland; and a visit to the Musée des Arts Décoratifs will satisfy the most captious critic that both artists were the equals of the great masters of the Renaissance.

Moreau-Vauthier worked in marble and in bronze. His "Jeune Faune" and his "Pascal, enfant" must be remembered by all visitors to the 1889 Exhibition in the Champ de Mars for their grace and vigor. "La Peinture," "Junon," "Une Bacchante," and "La Florentine," are also among the *chefs d'œuvre* of the sculptor. But it was "La Minerve," made for the Duc de Luynes, in the 1855 Exhibition, which inspired Vauthier to emulate the great creations of Phidias, and to reproduce, not a modern Athena of the Parthenon, or a Zeus of Olympia, but little statuettes and life-size busts, in the same materials, ivory and gold, which should have all the characteristics of the national art. He tinted the ivory, he clothed it in gold and silver, and decorated it with jasper and onyx, with enamel and precious stones — all in the greatest taste, with sobriety and refinement. What might have been an atrocious vulgarity under some hand was, under his, an example of elegance and perfect taste. Simart and Duponchel had paved the way in the "Minerve"; Moreau-Vauthier and Lucien Falize perfected the revival of the art in their "Gallia." Although France is the land of modern sculpture of a high order, she cannot afford to lose any of her children. A visit to the Luxembourg Museum will show us how great this last loss is to the world of art.

S. BEALE.

REYNOLDS'S INSTRUCTIONS FOR ERECTING AND TESTING LIGHTNING-CONDUCTORS.[1]



MAYOR'S CHAIR.
DEAL. ENG. des. by H. P. BURKE

1. *Position of Conductors.*— The angles and prominent features of a building being the most liable to be struck, lightning-rods should be fixed on gable ends, chimneys, turrets, etc., and they should be connected together by continuous conductors along the ridges.

2. *Height and Spacing.*— Lightning-rods should be about four feet high, and spaced at intervals not exceeding fifty feet, so that no point of the building is more than twenty-five feet horizontally from a lightning-rod.

3. *Specification of Material.*— The metal to be exclusively employed for the construction of new lightning-conductors is copper tape. A conductivity of at least ninety-five per cent of that of pure copper should be specified; and the tape should be soft and flexible, so as to admit of its following closely the outlines of the building. Copper tape $1'' \times \frac{1}{8}''$, weighing about half a pound per foot run, is the most suitable size for all ordinary conductors, and $1\frac{1}{2}'' \times \frac{1}{8}''$ may be used for very high chimney-shafts. In order that copper tape of long lengths, without joints, may be obtained, all future supplies for the use of this department will be obtained through the India Store Department.

4. *Protection from Theft.*— In situations where copper tape is liable to be stolen, it may be let into the walls of the building and cemented over, or otherwise concealed where it is accessible. The practice of protecting the lower portion of copper conductors on buildings by enclosing them in iron pipes at the base of the building is questionable.

5. *Earth-connections.*— In order to guard against those accidental defects and disarrangements to which conductors are liable, buildings provided with lightning-conductors should have, as a rule, at least two earth-connections, the conductors leading to them being connected at the base of the building either above the ground-line, or by a conductor under ground forming a "surface" earth.

Each lightning-rod should be connected direct to earth by the shortest path outside the building, and, when practicable, it is well to carry the conductor down that face of the building which is most exposed to rain. In the case of gabled buildings, the conductor should be taken down the barge-courses in preference to the gable, so as to protect the angle of the building.

6. *Earth-coils.*— When the level of water or permanently wet soil lies within a few feet of the surface, the conductors should terminate in earths offering each about eighteen square feet of external surface. These may consist of copper plates about $3' \times 3' \times \frac{1}{16}''$, rivetted to the ends of the conductors and buried in water or permanently wet soil from fifteen to twenty-five feet from the building. A better plan, however, is to coil the end of the conductor spirally on a wooden frame, the external diameter of the coil being four feet, with six-inch intervals between the turns. About thirty-three feet of tape is required for this earth-connection; it obviates the necessity of any underground joint, taps a larger surface of earth, and, the tape being twice the thickness of the plate, it is more durable, besides being a cheaper arrangement.

7. *Wells.*— When the permanent water-level is deep, it may be necessary to sink special wells for the earth-plates, which should be of the same size as those specified in the previous paragraph. The wells should be carried down several feet below water-level in the driest seasons, and the bottom part of the well should be built dry.

If coils of copper tape, however, be employed for earths, special wells are not necessary, because, there being no joints underground, the necessity for visual examination, periodically, no longer exists. In this case, the earth-coils may be buried at the bottom of a pit sunk below the level of permanently wet soil.

Where the depth is considerable, two or more conductors may be connected to the same earth-plate, and, in the case of a coil of tape, the inner as well as the outer end may be brought up to the surface of the ground so as to form two earth-connections. In both cases, the size of earths should be made proportionately larger.

8. *Surface-earths.*— In addition to these deep earths, it is necessary to provide surface-earths laid in trenches from one foot deep in clay soils to two feet deep in sand or shingle, through which the rain percolates more freely.

These surface-earths may consist of that portion of the conductor which leads from the base of the building to the well or deep earth, or they may be arranged as separate conductors led in trenches away from the building. In the latter case, the deep and surface earths should be connected together with a conductor carried round the base of the building.

The length of each surface-earth trench may be from twenty-five feet in ordinary soil to fifty feet in dry soil, and the width at bottom should be about nine inches. A few inches of powdered charcoal should be spread both above and below the conductor, and the trench filled-in with light soil. Any rain-water down-pipes may, with advantage, be led into these trenches.

9. *Sea-earths.*— In the case of buildings near the sea, good earths can be obtained by laying a length of tape so that at least five square feet of it shall always be under water; or a coil of tape may be buried in permanently wet sand.

When the distance to the sea is considerable, these earths should be supplemented by surface ones round the building, so as efficiently to tap any induced charge in its vicinity.

10. *Iron Pipes.*— Iron water-pipes, etc., form good earth-connections. Soft-metal pipes and gas-pipes should not be used, but, when they run close to the conductors from a building, they should be connected to the lightning conductor or system. There are many recorded instances in which both water and gas pipes have been damaged by lightning springing onto them from neighboring conductors, which would have been obviated if they had been connected thereto.

11. *Dry and Rocky Sites.*— In extremely dry or rocky situations it is almost impossible to obtain good earth-connections, except at a great distance. In such cases, the best plan to adopt is to bury several hundred-weight of old iron at the foot of the earth coil or plate in the mass of coke or charcoal, leading any rain-water pipes or drains so as to discharge into it.

12. *Coke, Charcoal, etc.*— Coke, charcoal or smith's ashes will be found very suitable for improving the earth-connections of lightning-conductors. A layer of about three inches should be spread both below and above the conductors in the trenches, and also round the earth plates or coils.

13. *Flag-staff Earths.*— The earth-connections of flag-staffs near magazines should be led in a direction away from the building. Should, however, the horizontal distance between the flag-staff and the nearest lightning-rod on the magazine be within fifty feet, or should any portion of the building be within the cone protected by the flag-staff-rod, then the magazine and flag-staff earths may be connected, or have an earth common to both. This rule is also applicable to shafts of powder-mills, etc.

14. *External Masses of Metal.*— Rain-water pipes and gutters should never be utilized as a portion of a system of lightning-conductors, to which, however, they should be connected. All external masses of metal, such as copper sheeting on magazine-doors and ventilators, etc., should also be connected to the nearest conductors by lengths of copper tape.

In the construction of magazines and other buildings in which the manipulation of explosives is carried on, the employment of external masses of the metal should be avoided as far as possible.

15. *Lines of Rail, etc.*— Lines of rail near buildings protected by lightning-rods should be connected to earth direct on both sides of the building, and when the line is carried inside the building it

[1] Reprinted from *Indian Engineering*.

should be connected also to the system of lightning-conductors. Iron railings round magazines should be connected direct to earth at intervals of about fifty feet.

16. *Internal Masses of Metal.* — All large and long masses of metal, such as beams, girders, pipes, water-systems, and large ventilators fixed in the interior of the buildings, should be electrically connected with the earth as well as with the conductor; but soft-metal gas-pipes should never be used as conductors, and the lightning-conductor should be kept as far as possible from them, and also from all internal gas-pipes.

17. *Fixing Conductors.* — Lightning-conductors should not be insulated from the buildings to which they are attached. The copper tape should be laid on the ridges and walls, and secured by suitable fastenings screwed or nailed to the building. The hold-fast should be of copper or gun-metal, fixed by nails or screws of hard copper; and they should allow for expansion and contraction, at the same time preventing all the weight falling on any one bearing.

18. *Metal Roofs.* — Buildings with zinc or galvanized roofs should be protected by copper conductors laid over them, but protected from actual contact by strips of wood, paint or tarred felt. The zinc roof itself should be treated like any other external mass of metal, and should be thoroughly well connected to the conductors in several places. The system, sometimes adopted, of having sheet-zinc lightning-rods and copper tapes from the eaves of the roofs to earth is very unreliable, because the lightning-rods are of ineffective section, the zinc sheets are insulated from one another by a layer of oxide, and the joint between the zinc and copper is liable to failure.

19. *Chimney-shafts.* — Chimney-shafts should be protected by a ring of copper tape $1\frac{1}{2}'' \times \frac{3}{16}''$, placed round the outside of the top of the cap and a few inches below it, having stout copper points projecting one foot above the top of the shaft at intervals of two or three feet all round. Copper tapes should be carried down on opposite sides of the shaft to earth from the ring; and these conductors should be connected at the base, a test-joint being added to enable the continuity of the conductors and the state of the earth-connections to be ascertained when necessary.

20. *Joints in Conductors.* — Metallic continuity should be insured at the joints of all conductors. The conductor should, therefore, if possible, be made up in one continuous piece, of the proper length, before it is sent out to be erected. The joints between copper tapes should be made by close rivetting, and should be carefully brazed and painted over. When brazing is impracticable, as when it is necessary to make a joint *in situ*, the joint should be rivetted as before and imbedded in a mass of solder. In rivetting copper plates, five rivets should be used, and the holes should be bored, not punched; the "arris" being removed and the surfaces brightened with emery, the joint should be brought together with a hollow punch before rivetting.

21. *Joint between Lightning-rod and Conductor.* — The connection between the lightning-rod and the conductor should be made by means of a slotted clamp similar in design to those employed for test and other joints. The lightning-rod should terminate at its lower extremity with a $\frac{3}{4}''$ bolt, screwed into the clamp, and thereby making firm contact with one or more tapes inside it. The conductor should also be brazed or soldered to the clamp as described in the preceding paragraph. The lightning-rod should, if possible, be sent out connected up with the conductor, ready for fixing.

22. *Repair of old Conductors.* — For the repair of old lightning-conductors, however, it may sometimes be necessary to use solder. For copper, the solder usually employed consists of equal parts of tin and lead, which has a resistance nearly ten times that of copper. The surface of the joint should, therefore, be not less than $1\frac{1}{4}$ square inches.

Molten zinc should be used for soldering iron conductors. Being nearly twice as conductive as iron, the surface of the joint need not necessarily exceed that of the cross-section of the conductor.

In both cases, the joint should be put together previously by screws or rivets, and the soldered joint, especially in underground work, should be carefully protected from galvanic action by tarred tape.

23. *Connecting Wire Rope to Copper Tape.* — Existing iron-wire rope-conductors may be connected to copper tapes in the following manner: Take a piece of sheet-copper $4\frac{1}{2}'' \times 3'' \times \frac{1}{8}''$, and have one side tinned; cut it down at one end to the size of the tape for a length of $1\frac{1}{2}''$, and rivet the tape to the sheet at this part; then bend the remainder of the sheet round the end of the rope, which should have been previously frapped with fine wire, thus forming a tube with the tinned side inwards. Sweat up the joint with zinc solder, and protect it by tarred tape bound tightly over it.

24. *Connection to Iron Water-pipes.* — Copper-tape conductors may be connected to iron water-pipes laid underground by filing about a foot of the top of the pipe bright, binding the tape onto it by wire, and soldering with zinc; or a short length of iron bar $2'' \times \frac{1}{2}''$ may be rivetted and soldered to the copper tape, and then bolted to the flange of the pipe by $\frac{1}{2}''$ screws passing through both the bar and the flange.

It is a good plan to coil several turns of the copper tape round the pipe (keeping it from actual contact by slips of wood) previous to fastening the end, so as to increase the earth-connection should the joint ultimately fail. The greatest care must in all cases be taken to protect the joint from galvanic action, by layers of tarred rope, or by imbedding the joint in cement.

25. *Expansion of Conductor.* — The variations of temperature produce an expansion and contraction in copper conductors which should be provided for by allowing the conductor free play through the hold-fasts employed to fix it to the building, and by leaving a small loop of the tape in some portion of its length. Conductors should never be screwed or nailed down. Vertical conductors on shafts, flag-staffs or high walls should have small loops above every second or third hold-fast, to take the weight off the conductor while still allowing for expansion and contraction. The hold-fasts in this case should be about four feet apart.

26. *Conductors not to be tampered with.* — In carrying out repairs to buildings, maistries and coolies must be specially warned never, under any circumstances, to disconnect, move or tamper with any portion of a lightning-conductor unless specially ordered to do so, and then only under the supervision of the officer in charge of the work.

27. *Records of Conductors.* — Records of all lightning-conductors should be kept in every divisional office, and should contain as many of the following particulars as possible:

(*a*) Date of erection or reconstruction.

(*b*) Character of soil or sub-strata, and depth of permanent water-level or wet soil.

(*c*) Full particulars of lightning-rods, conductors and earth-connections, nature of joints and connections, etc.

(*d*) Details of all external or internal masses of metal entering into the construction of the building, and how connected to conductors.

(*e*) Positions of test-joints, if any. Nearest earth available for testing, etc.

(*f*) In case of magazines, etc., quantity of powder, etc., usually kept in store.

(*g*) Date of last inspection, and *précis* of former tests, suggestions, etc., of inspecting officer.

(*h*) In case of buildings not under the immediate charge of the Public Works Department, name or title of person to whom notice of inspection should be sent.

28. *Periodical Inspection.* — Lightning-conductors should be inspected and tested once a year, and a report drawn up showing the result of such inspection.

29. *Electrical Tests.* — The object of electrical tests of lightning-conductors is to determine the resistance of the earth-connections and to localize the position of any defective joints or connections in the conductors. The resistance of a conductor itself is quite inappreciable (less than $\frac{1}{4}$ ohm per 1,000 yards for copper tapes $1'' \times \frac{1}{8}''$), and cannot be detected by the testing-apparatus usually employed. The resistance of the earth depends on the nature of the soil and its state of moisture at the time of test. As a rough guide, however, it may be mentioned that the joint resistance of two earths such as those described in paragraph 6, thirty yards apart in wet soil, will not exceed two ohms, and the greatest resistance offered by any earth must not exceed ten ohms.

30. *Defective Joints Localized.* — The resistance of the conductors from summit to ground-line, or to that part of the conductor from which the resistance of the earth-connections is ascertained, should, therefore, be practically *nil*. Any resistance in excess of that of the battery and leads must be due to defective joints, and the faults should be localized and marked for repair; and to enable this to be done test-joints should be added to all conductors.

31. *Conductors made in short Lengths.* — Conductors made in short lengths and connected by joints must have their metallic continuity insured by soldering or a good system of rivetting, and the joints, when tested electrically, must give no resistance. Underground joints and earths the nature of which is not known should be dug up and examined when practicable.

32. *Test-joints.* — Where the system of lightning-conductors has more than one earth-connection, it is necessary to introduce test-joints to enable the resistance of each earth-connection to be ascertained separately. These joints consist of a slotted clamp to which the two portions of the tape are attached by bolts.

Where the cross-connections between conductors or external masses of metal are few, these joints can be inserted in these cross-connections; but where the system of conductors is complicated, they must be placed on the conductors themselves, the object to be kept in view being that by means of the test-joints it shall be possible to isolate each earth separately for purposes of testing.

They must, therefore, be placed in convenient positions, so that the conductor can be disconnected without difficulty when required.

After the tests have been completed, the test-joints must be carefully re-made, the contact surfaces thoroughly cleaned with emery and brought into intimate contact with the bolts. The joint should then be covered with waterproof tape and painted over. When the joint has been completed it should be tested for metallic continuity. A space should be formed or left behind the joint to allow the tape to be passed round the conductor.

Single conductors without cross-connections to metal down-pipes or gas or water pipes do not need test-joints.

33. *Test-leads.* — In order to test the continuity of conductors fixed to inaccessible places, such as flag-staffs, chimneys or steeples, an insulated test-lead must be led up the flag-staffs or other erection, and at its upper extremity attached and soldered securely to the lightning-rod above its junction with the conductor. This lead should be of Hooper's core, metal (lead) covered, resistance not to exceed ten ohms per mile.

34. All lightning-conductors on public buildings should be brought, as far as possible, into conformity with these rules; but existing arrangements may generally be allowed to stand, provided care be taken to improve defective earth-connections and to make good all joints.

SOCIETIES

AMERICAN INSTITUTE OF ARCHITECTS.

THE unexpected and much-to-be-regretted resignation of Mr. Dankmar Adler from the office of Secretary of the American Institute of Architects made it incumbent upon the Board of Directors to assume a responsibility which has never before fallen upon them, and, as a result of their deliberations, I have been selected to fill the office for the current year, and have undertaken its duties with a full sense of the grave responsibilities which it involves.

As this year is to be marked by the opening of the Columbian Exposition, an event which will bring to these shores many foreigners, and will be marked by the holding of an International Congress of Architects in Chicago, it is hoped to make the next convention and this Congress one worthy of the occasion, and to devote it principally to the reading of short papers relating to the design, construction and decoration of the Columbian Exposition buildings and grounds, and to visits to the Exposition. I am therefore requested by the President to call your attention to the importance of a large increase in the membership of the Institute, in order that our society may be in reality the representative body which it should be and only can be by enrolling as members a large majority of the architects of the country, whose professional lives conform to the definition of an architect as contained in Sec. 3, Art. III of our Constitution, and whose conduct is in accordance with Sec. 4 of the same Article.[1]

In order to increase our membership, this appeal is made to you as an active professional member of the Institute, and as a member of a Chapter in the Institute, to ask you to do all in your power to further this object by individual effort and by adopting active measures within your Chapter.

Mr. Richard M. Hunt, in his most admirable annual address, delivered at Cincinnati in 1889, upon the eve of the consolidation of the American Institute of Architects and the Western Association of Architects, expressed his views of the importance of the Chapter as a factor in the life of the Institute, and forcibly asserted that "the Institute depends upon the Chapters for its very life-blood, and could not exist any more than the body without its members if the Chapters were not alive and active. Chapters should therefore be strong in membership and earnest in work, perfecting every suggestion for the advancement of the profession, considering and furthering all educational and helpful methods, and bringing to the conventions of the Institute all matters accomplished and under consideration that may be of interest to the profession at large.

"The practising architect, from the very diversity of his duties and requirements, gains largely by constant intercourse with his *confrères*. The interchange of ideas and personal experience is of inestimable benefit to him and to his clients; in fact, it should be the self-protective duty of every architect to belong to one of the Chapters. I would here suggest that too often young men, fresh from study, in the fire of ambitious enthusiasm, but yet untaught by stern lessons of experience, are eager to establish new leagues, associations, socities and clubs, rather than affiliate with established institutions and reap the profit of proved effort.

"A little reflection would teach them that the older institutions have formulated those rules and regulations, those principles of art and practice, which have elevated the profession in America to its present honorable standing; that through the *in*sistent and *per*sistent course of the Institute for the rights, for the dignity and for the position of architecture as a fine art, so long ignored in this country, they have, through precedents created for them, been spared some fierce contests.

"Let them, rather, profit by the paternal care of the Institute as their adviser and advocate, stretching forth with the strength and vigor of new inspirations to reach the ideals of its standards, taking for the underlying principle mutual assistance and coöperation in the more familiar intercourse of the Chapters."

Whatever doubts may have been entertained as to the wisdom of consolidation have long since been dispelled, and now we realize the need of a larger constituency; and as it is only by Chapter growth that the Institute can increase its membership,—as no person is eligible to membership in the Institute unless he is already a member of a Chapter,—it is recommended that the Chapters at once take active steps to bring into fellowship all who are eligible within their territory, making such changes in their by-laws, if any are required, by which those who live at so great a distance from their usual place of meeting as to prevent their attendance at Chapter meetings shall have their dues reduced or entirely abated.

It is also urged upon the Chapters that if, in their judgment, new Chapters could be advantageously formed in their own State or vicinage, that the officers of such Chapters constitute themselves a committee to urge the formation of new Chapters, and to call upon the Secretary of the Institute to aid them in their work.

While it is not deemed best that the Secretary make perfunctory tours through the country at the expense of the Institute, it is considered a part of his duty to go where his presence will aid in forming new Chapters or fostering the work in Chapters already formed, and when notified that his presence is desired he or a deputy will be sent to render the desired service.

It is now felt that the formative period of the Institute is passed, and it is hoped and expected that the large body of young men who have grown up since its formation, and who are unconsciously reaping the great advantage of the missionary and formative work which has already been done, will now come forward and swell its ranks, take a more active part in its management, infuse into it a new and higher life, and bring to it not only the work of the pencil but enrich it by discussions and the presentation of the new problems which afford constant opportunities for such papers, the lack of which has of late been frequently remarked.

It is also desired that some plan be formulated to put into practical form a scheme for mutual defence, which has been considered by many members of the profession one of the imperative duties of the Institute.

To bring about these and many other needed reforms, the first step is the increase of numbers, and the next and not less important is that every member "lend a hand" and assist by positive work to make himself felt as a factor in the upbuilding of the Institute, and as a necessary sequence secure a mighty increase in the influence and power of the profession of architecture in shaping the future of this country, which affords an unprecedented opportunity for architectural development and growth.

ALFRED STONE, *Secretary.*

[1] ART. III, SEC. 3. The status of an architect is hereby defined as follows: An architect is a professional person whose occupation consists in originating and supplying artistic and scientific data preliminary to and in connection with the construction of buildings, their appurtenances and decorations; in supervising the operations of contractors therefor, and in preparing contracts between the proprietors and contractors thereof.

SEC. 4. No member shall accept direct or indirect compensation for services rendered in the practice of his profession other than the fees received from his client.

THE ILLUSTRATIONS

[Contributors are requested to send with their drawings full and adequate descriptions of the buildings, including a statement of cost.]

THE CAPITOL AND STATE BUILDINGS, HARRISBURG, PA. ROBERT MILLS, ARCHITECT.

[Helio-chrome, issued with the International and Imperial Editions only.]

THIS State-house was erected between 1819 and 1822, under the supervision of Stephen Hill.

HALL IN THE HOUSE OF N. POULSON, ESQ., LONG ISLAND, N. Y.

SEE article "A New Fireproof Construction," elsewhere in this issue.

MODEL SHOWING METHOD OF FIREPROOF CONSTRUCTION DEVISED BY MR. N. POULSON.

SEE article elsewhere in this issue.

HOUSES FOR CHARLES E. PALMER, ESQ., ON JEFFERSON AVE., BROOKLYN, N. Y. MR. OTTO J. GETTE, ARCHITECT, NEW YORK, N. Y.

HOUSE ON LANARK ROAD, BOSTON, MASS. MR. EDWARD LITTLE ROGERS, ARCHITECT, BOSTON, MASS.

THIS house is on the southwest side of Lanark Road, quite near the Beacon Boulevard, and in the beautiful Aberdeen district. The lot has a frontage of 95 feet, and an area of 9,484 square feet. The house is built of stone, first story, and is shingled above, and is thoroughly well finished throughout. Large, light, sunny rooms, and an abundance of closets, fitted with all modern conveniences. The dining-room has panelled wainscot and panelled ceiling, and is finished in quartered oak. The hall has panelled wainscot and is finished in quartered oak. The library has bookcases and is finished in butternut. Careful attention has been given to the plumbing.

HOUSE OF A. SCHWARZMANN, ESQ., SHELTER ISLAND, N. Y. MESSRS. WAIT & CUTTER, ARCHITECTS, BOSTON, MASS.

BUILDING AT THE CORNER OF KINGSTON AND ESSEX STREETS, BOSTON, MASS. MESSRS. WINSLOW & WETHERELL, ARCHITECTS, BOSTON, MASS.

[Additional Illustrations in the International Edition.]

TOWN-HOUSE, BOLSWARD, HOLLAND.

THIS plate is copied from *La Construction Moderne.*

COMPETITIVE DESIGN FOR ST. LUKE'S CHURCH, WINNINGTON, ENG. MESSRS. EDEN & WILLIAMS, ARCHITECTS.

THIS plate is reproduced from the pages of the *Builder.*

COURTS-OF-JUSTICE, FRANKFORT-ON-THE-MAIN, GERMANY.

THIS plate is copied from *Zeitschrift für Bauwesen.*

SCHLOSS PFLUGENSBERG, NEAR EISENACH, GERMANY. HERREN L. NEHER & A. VON KAUFFMANN, ARCHITECTS, FRANKFORT-ON-THE-MAIN, GERMANY.

THIS illustration is copied from *Architektonische Rundschau.*

UNIVERSITY COLLEGE, LIVERPOOL, ENG. MESSRS. ALFRED WATERHOUSE & SON, ARCHITECTS.

AMONGST the notable developments of recent years is to be counted the creation of the Victoria University. Few who, some years since, watched the beginnings of the Owens College, in Manchester, would have ventured to predict its association with the colleges of Liverpool and Leeds as one great modern university carrying on its educational functions in the three splendid groups of buildings which are known as the Yorkshire College at Leeds, the Owens College at Manchester and the University College at Liverpool. The Liverpool College will probably be largely extended by the erection of further buildings, which will complete one great central quadrangle; but for the present building operations are over, and the long frontage to Brownlow Hill will practically afford a complete exterior presentment of the college buildings for all time. By the courtesy of Principal Rendall we are enabled to give some realization of the picturesque aspect of the college from sketches made on the spot, just before the buildings were officially opened by Lord Spencer.

Practically the Liverpool University College buildings have been created by the munificence of her citizens in their private capacity, which was lately recognized by a great statesman as a striking characteristic of the city. The Queen has shown a special interest in this great educational development in the north by a contribution to the funds, as recently announced by Mr. Bryce, Chancellor of the Duchy of Lancaster, whose name will always be associated with the two colleges of Manchester and Liverpool.

The New Victoria Building of the University College is, in the words of the inscription engraved upon the south front, "Raised by men of Liverpool, in the year of our Lord 1892, for the advancement of learning and the ennoblement of life." The western wing of the building which adjoins the Engineering block, erected at the cost of Sir Andrew Walker, Bart., and is separated from it on the ground-floor by a wide carriage archway with a groined roof, leading into what will be eventually the inner quadrangle of University College, contains the Tate library, and is, to quote another inscription, "The Gift of Henry Tate." The most noticeable feature of the southern elevation is the Jubilee Tower, which rises over the central entrance and bears on its four sides the explanatory legend, "*Victoriæ Reginæ Dei Gratia L. Annos Feliciter Regnanti Cives Posuerunt.*" The clock and bells, which occupy the upper stage, are the gift of Mr. Hartley, and the face of the former, as well as the Latin inscription, is executed in glass mosaic, in which gold and blue tones predominate. The exterior generally is of ordinary selected local bricks with red terra-cotta dressings. This treatment is further relieved in the library wing by bands of red Ruabon brickwork. The east end of the building has a special individuality of character from the round or rather polygonal form suggested by the internal requirements, for this portion of the accommodation is occupied on the upper floor by a large semicircular theatre with raised seats, which can be adapted either to the purposes of an audience or the more special requirements of an examination, in which case isolated desks and chairs take the place of the rows of seats.

The central entrance leads into a vestibule which lies within the four walls of the tower and gives access to the great hall, a large chamber two stories in height with an apsidal termination at the east end, separated from the staircase by a range of arches which form a kind of aisle on the southern side. This hall, which is sixty-eight feet long and thirty feet wide, is lighted by tall mullioned and transomed windows on the north wall, and is lined with "Burmantoft's" faïence, a material which also forms the mural decoration of the principal staircase. The great hall extends upwards to the level of the first-floor ceiling, and it is a special feature of the first-floor corridor that it is formed into a balcony overlooking the hall, resembling the triforium of a church. East of the hall, in the portion of the building which is placed under the large theatre, lie the students' common-room and reading-room. On either side of the vestibule are the clerk's and the porter's respective rooms, while the long corridor (100 feet in length) which leads from the hall to the engineering block has classrooms on the north side and professors' private rooms upon the south.

The first floor, which may be reached either by the principal staircase or by two secondary flights, one near the western archway and the other in the northeast angle, contains more class-rooms (the largest of which is forty-three feet by twenty-two feet) and one or two professors' rooms. Over the archway comes a reading-room, connected with the senate-chamber, which latter is twenty-seven feet square and has a bay-window overlooking the street. These apartments are part of Mr. Tate's gift, for his liberality extends not to the library proper alone, but to the whole block of building in which it is placed. The senate-room has a dado, ceiling and floor of oak, and testifies to the donor by the H T monograms on the corbels of the ceiling-beams. As the east end of the ground-floor was given up to the comfort of the male students, so the first floor is dedicated to the ladies, who here have a common-room and a reading-room for their special use. In the former there is a range of faïence columns supporting the curved wall of the theatre above, and the room is further distinguished by having a walnut chimney-piece, the carving on which is executed by Miss Gordon.

The conspicuous turret at the southeast corner contains a circular staircase, which, though starting from the ground-floor, does not communicate with the first floor, but passes on to give access to the upper seats of the theatre — the intention being that when the public are admitted to any performances in this auditorium they should have a means of admission to their seats without passing through the college-rooms. This stair is a fine example of spiral concrete step-work, and has a striking effect seen from below.

The second floor is not of less importance than the floors below, for it contains the lecture-theatre, which seats 500, and the library, which will hold 80,000 books. The theatre, which is a semicircle in form, has a radius of thirty-nine feet, and the floor-space of the library measures no less than 102 feet by 49 feet.

The entrance to the library is through a vestibule lying just off the principal staircase, in which is fitly placed a bust of Mr. Tate by Alfred Gilbert, R. A., and a tablet which commemorates the gift. There is another piece of sculpture in the building, viz, the statue of Mr. Christopher Bushell, the first vice-president, by Mr. Bruce Joy, which finds its place in the apsidal portion of the great hall. To return to the library: the book-shelves are arranged so as to project from the outside walls, that is, to stand transversely across the room, leaving a central passage (which in days to come, when books are multiplied, will be gradually encroached upon by an extension of the shelves), and dividing the sides of the library into bays some twelve feet wide. On the south side the recesses of the aisle alternately have sloped roofs and open mullioned lights connecting with the main nave, or run up into dormer chambers planned for the storage of books. All the visible joinery in this room is of oak, and there is an open-timber roof of wrought pitch-pine. Beyond the library is the librarian's room, and beyond that again a snug retreat for special readers, who will be provided, as will also the general readers, with every luxury of library furniture.

Again ascending, we find the third floor mostly occupied by the upper part of the library and the lecture-theatre, for the former has an extensive gallery lined with shelves, and three large gable recesses fitted up as book-stores. What remains of the story is given up to the requirements of art. There are also, it should be mentioned, some art-studies on the floor below, so that this department is not meanly housed.

The building is fireproof throughout, the floors being of concrete, on an iron framework. Messrs. A. Waterhouse & Son are the architects, the design having been prepared by Mr. A. Waterhouse, R. A., in 1888, from which year the contract dates. This description and the accompanying illustrations are copied from the *British Architect.*

SHOPS, MOUNT STREET, GROSVENOR SQUARE, W., LONDON, ENG. MR. T. E. COLLCUTT, ARCHITECT, LONDON, ENG.

ALTHOUGH Britons have for a long period formed a nation of shopkeepers, it must be admitted that the conditions of trade are not auspicious for any one who is eager to impart architectural qualities to a shop. It is easy to perceive in the illustration we publish where Mr. Collcutt was hampered, as well as what could be done if there was less faith in the virtues of immense sheets of plate-glass and prominent signboards or fascias among London shopkeepers.

MIDDLE-CLASS FLATS, GRAHAM ROAD, HACKNEY, E., LONDON, ENG. MESSRS. ESSEX, NICOL & GOODMAN, ARCHITECTS, LONDON, ENG.

THE illustration shows the block of flats now in course of erection. They occupy a site near the Hackney Station of the North London Railway. They comprise six separate buildings, each six stories high, with separate staircases to each, leading to suites of two, three and four rooms, the suites being so arranged that they can be converted into suites of five. Each has a kitchen with larder, sink and dust-shoot and water-closet; the wash-houses are in the roof with drying-flats adjoining. The material used in elevation is pressed red brick and stone-and-tile roof. The whole of the floors and staircases are of concrete, thus rendering the buildings completely fireproof. The open spaces between the various blocks will be laid-out as public gardens. There will be 414 rooms in the whole block when completed.

THE CATHEDRAL, OR DOM, FRANKFORT.

COMMUNICATIONS

[*The editors cannot pay attention to demands of correspondents who forget to give their names and addresses as guaranty of good faith, nor do they hold themselves responsible for opinions expressed by their correspondents.*]

THE ROOF OF THE CASTLE OF CHILLON.

San Francisco, Cal., March 8, 1893.

To the Editors of the American Architect: —

Dear Sirs, — Please inform me of the material, and color of same, with which the roof of Chillon Castle is covered, and oblige

S. C. Benson,
418 California Street.

NOTES AND CLIPPINGS

Ventilated Roofs and Floors. — Mr. W. B. Gwyther, A. R. I. B. A., of the Indian Public Works Department, has devised a new form of ventilated roofing and floors suitable for tropical climates. The object of the invention is not only to prevent the penetration of heat through the roof or damp through the floors, but also to provide a means of carrying away heated and vitiated air from inside. The method consists in the use of hollow tubes of earthenware: in the case of flat-terraced roofs these are employed as a substitute for ordinary flat tiles which support the roof-concrete. The tubes are laid closely side by side, and, where they meet, end to end, a cross-flue to secure more perfect ventilation is formed by the use of half-pipes. The ends of these flues, when feasible, should be provided with iron gratings for the ingress and egress of air; the ends of the hollow tubes where they rest on the wall should open into a longitudinal flue made in the wall. Where lateral openings or gratings cannot be arranged, vertical openings through the roof, covered with bent pipes, may be resorted to as an alternative. To draw away the vitiated air from below, perforations in the under side of the tube have been devised. The efficacy of these openings in removing air from the upper part of rooms rests on the fact that heated air moves upward, and, after passing through the small apertures, will be carried off through the tubes and cross-flues, within which a movement of air will always be going on. In the case of floors the prevention of damp can be effected very thoroughly by the doubly-ventilated space. The sysem is being used in the New School of Art building, in Chowringhee, Calcutta, where, it is hoped, some records will be taken next hot weather to show the effect of this special construction. — *Invention.*

Heavy Artillery in the Past. — In view of the following statements, it is not strange that architectural havoc followed the footsteps of the Turks: In 1478 Mohammed II, in forming the siege of Scutari in Albania, employed fourteen heavy bombards, the lightest of which threw a stone-shot of 370 pounds weight, two sent shots of 500 pounds, two of 750 pounds, two of 850 pounds, one of 1,200 pounds, five of 1,500, and one of the enormous weight of 1,640 pounds, enormous even in these days, for the only guns whose shot exceed the heaviest of these are our 80-ton guns, throwing a 1,700-pound projectile, our 100-ton, throwing one of 2,000 pounds, and the 110-ton, throwing an 1,800-pound shot with a high velocity. The stone-shot of Mohammed's guns varied between twenty and thirty-two inches in diameter, about the same height as a dining-table; 2,534 of them were fired on this occasion, weighing, according to a calculation of General Lefroy's, about 1,000 tons, and were cut out of the solid rock on the spot. Assuming twenty-four inches as the average diameter of the shot fired at this siege, the total area of the surface dressed was nearly 32,000 square feet. At this siege the weight of the powder fired is estimated by General Lefroy to have been 250 tons. At the siege of Rhodes, in 1480, Mohammed caused sixteen basilisks, or double canon, to be cast on the spot, throwing balls two to three feet in diameter. — *Chambers's Journal.*

The Remains of St. Bridget. — During the repairs which have just been made in the Church of San Lorenzo in Panisperna, where Leo XIII was consecrated a bishop just fifty years ago, an important discovery took place. It consists of a marble sarcophagus, which, according to the inscriptions thereon, contains some of the remains of the celebrated St. Bridget. The relics consist of a part of her shoulder-blade and other smaller bones, and their identity is further confirmed by documents found in the archives of the church. It is stated in these records that other portions of her body have been removed to Sweden and placed in the celebrated monastery of Vaslena. The sarcophagus was found beneath the altar in the second chapel to the left of the chancel. There are so many people of the Anglo-Saxon and Celtic race who bear the popular name of Bridget that the news of the discovery of the remains of St. Bridget will doubtless prove of interest to many readers of the *Tribune.* — *New York Tribune.*

The Pohick Church Planned by Washington. — The old Pohick Episcopal Church in Fairfax County, Va., for the rebuilding of which George Washington drew plans in 1773, is still standing. "The exterior," says the rector, "presents the same appearance it did when Washington drove up to it regularly on Sundays in his famous coach. The interior suffered severely during the late war. All the woodwork was destroyed except the cornice, which is the only interior work still existing from Washington's time. The roof was left in a ruinous condition after the war, but the old timbers are still there well protected by a covering of good shingles. About eighteen years ago the church was put in good repair, though not restored to its original interior appearance, through the kindness of a gentleman then living in New York City. Much needs to be done to restore the church to its former antique interior, but it is comfortable and properly cared for." — *N. Y. Tribune.*

The Unit of Real-estate Value. — Cities have their own peculiar methods of buying and selling property, particularly real-estate. When an important sale is made in New York, for instance, the amount is at so much a front foot. Large values are better appreciated when reduced to the standard of front feet. Several of the leading cities of the United States, however, have never adopted the New York method. In Washington real estate is sold by the square foot. In Chicago both methods are in vogue. In Philadelphia the front foot is seldom heard of. Baltimore sells by the lot without regard to front feet or square feet. Atlanta sells by the front foot. The front-foot method seems to make the property appear more valuable than it really is, and growing towns generally adopt it to impress the new-comer with the idea that he is in the midst of a great "boom." — *Exchange.*

TRADE SURVEYS

Jobbing and mercantile interests throughout the East have made forecasts for the coming nine months. One of the results is to carry larger stocks, or, rather, to provide for a greater demand when the next distributing season sets in. In all lines of textile goods, distribution in both wholesale and retail lines has surpassed all former seasons, and word comes this week from the factories and warerooms that stocks are unusually low. Another outcome is that large purchases of cotton have just been made, and contracts for yarn are now being placed on a liberal scale, though this is not the usual time for such contracts. The reason assigned is that cotton is low, wool is low, and stocks need replenishing. In hosiery and knit-goods there has been great activity in all lines, despite enormous importations. In clothing, the distribution has been extraordinary, and manufacturers feel encouraged to enter upon a rehabilitation of stocks before the proper season. In boots and shoes, the published statistics of sales are very gratifying, and, as stocks are practically nothing, there will be greater mid-season activity than usual. The quick action of manufacturers to protect themselves against a tanners' trust has been quite a surprise, and it is a question whether, eventually, the two organizations will not become one. The paper-making industry has been passing through a severe struggle, due to extreme competition and an undue expansion of digester capacity. Straw, wrapping and other cheap paper is becoming a drug on the market. All kinds of pulp are in good supply, and prices show an improving tendency under wiser management in selling and seeking business. The paper-making industry has reached a point in its progress where nothing but prudence will enable it to avert harm. Commercial methods in supplying the markets of the country with staple products are changing in minor particulars. The need of more traders in a community is looked into when new credits are solicited. Substantial progress is being made in the matter of credits. More business is being done for cash, less bartering is done at cross-road stores, more frequent settlements are being made, and less risk is run: so say the commercial agencies. Another thing, worth passing notice, is the very general extension of small industrial plants. Fewer new concerns are being started, but it is, perhaps, quite safe to say that last year fully one-third of the industrial establishments of the country made material improvements, amounting, possibly, to from ten to ninety-five per cent of the value of the plant. This, in the aggregate, is an immense sum, of which no special notice is taken. From all that can be gathered, there will be a greater extension of capacity this year, a greater taking-out of old or half-worn machinery and equipments, and a putting-in of newer. This also, in the aggregate, represents an enormous sum. The statement can be made on the authority of some of the best-known manufacturers of steam and electrical machinery that the crop of probabilities in the way of orders and contracts was never as large or as promising as at present. This statement is strengthened by the evidence of machine-shop extension visible everywhere. Railroad earnings are only fair. Speculation in securities is restricted. Foreign buyers are very slow. American bankers believe that it is possible to restore all manner of American securities to European confidence, but there are too many million people among us who are not willing to pay the price of that confidence, and who believe we are better without it. Financial writers continue to sing their song to a harp with one string, but a broader policy than they indicate or comprehend will some day be developed. The conditions now influencing the markets of the world are temporary. Austria is about to call for another fifteen millions in gold; Germany is clamoring for more; Great Britain needs all her commercial policy can gather. All look to the United States for supply. The money per capita in circulation in the different countries of the world is as follows: United States, $25.62; United Kingdom, $17.90; France, $43.31; Germany, $16.40. The hostile forces in this country on the best financial policy will avoid an early conflict. There are no visible causes at work to lessen trade or to further depress prices, nor are the influences at work in the opposite direction very pronounced. The wage-workers of the nation are at work; prices were never lower, speculation never as harmless, and opportunities for enterprise and industry seldom more inviting. The exactions of middlemen are not hard to bear. An examination of condition of savings-banks and of building and loan associations shows a growth of funds, and, so far as can be known, a judicious investment of the same. House-buying on the part-payment plan has become quite general throughout the country, and this sort of investment is quite satisfactory in its return. The year 1893 will be a very active year in building. The reports from various large centres for the past month show that fully as many permits have been taken out as during same time last year. Iron and steel continue low in price. Planing-mill products can be contracted for summer and even autumn delivery at to-day's prices, so anxious are manufacturers for business. Lumber is under somewhat better control than a year ago. Everywhere is visible a conservatism of action which argues well for the future. If disaster comes, it will be from influences entirely disassociated from the management of the business men of the country.

S. J. Parkhill & Co., Printers, Boston, U. S. A.